SIEMENS

# SONOLINE G20 Ultrasound Imaging System
# [2] Instructions for Use

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Siemens Medical Solutions USA, Inc.

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# SONOLINE G20
# Ultrasound Imaging System
# [2] Instructions for Use

**Software Versions 1 and 2**

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# About This Manual

The Instructions for Use consists of two volumes:

- [1] Instructions for Use

  The *[1] Instructions for Use* includes both a general overview and a technical description of the ultrasound imaging system. This manual contains detailed information on the safety and care of the ultrasound system and its transducers. A chapter is dedicated to the description of all system controls. The *[1] Instructions for Use* also includes the procedures for system setup and beginning an exam.

- [2] Instructions for Use

  The *[2] Instructions for Use* includes procedures for acquiring and optimizing images. This manual provides procedures for general and exam-specific measurements and calculations.

The *System Reference* provides reference information for the ultrasound imaging system.

# Conventions

Conventions used throughout this manual are listed below. Take a moment to familiarize yourself with these conventions.

## Cross-References

This manual provides you information by topic. When additional information exists within this or other manuals, a reference graphic and the name of the book is provided in the right column. If the information exists within the chapter, a cross-reference to the page number is listed. Otherwise, information is referenced by chapter number.

**[1] Instructions for Use**

| | |
|---|---|
| Screen Saver | Ch 1 |
| Intended Use | Ch 1 |

**[2] Instructions for Use**

| | |
|---|---|
| Imaging Functions | Ch A1 |

## System Presets

You can use the options and settings available in the system presets menu to set up the ultrasound system with your preferences. Presets define the configuration of the system software whenever you power on the system.

A complete listing of system presets is located in the *System Reference*. Whenever a system preset is discussed in other chapters or in the User and Reference Manuals, a graphic is provided in the right column.

**System Reference**

| | |
|---|---|
| Accessories and Options | Ch 2 |

The graphic identifies a preset option or setting in the system presets menu that is available for you to customize your ultrasound system. The name of the category on the menu containing the system preset is listed for your convenience.

**F6**

Default Settings
▶Automatic Freeze Response

## Warnings, Cautions, and Notes

⚠ **WARNING:** Warnings are intended to alert you to the importance of following the correct operating procedures where risk of injury to the patient or system user exists.

⚠ **Caution:** Cautions are intended to alert you to the importance of following correct operating procedures to prevent the risk of damage to the system.

**Note:** Notes contain information concerning the proper use of the system and/or correct execution of a procedure.

## Control Panel Keys, Controls, and Menu Selections

Keys and controls located on the control panel are identified by uppercase, boldface type.

*Example:* Rotate the **DEPTH/ZOOM** control.

Function keys located on the keyboard are identified by the number of the function key.

*Example:* Press the **F6** key.

Menu selections are indicated with the name of the selection in boldface type.

*Example:* Select **Next** to access the second page of on-screen menu selections.

## Selection of On-Screen Objects

The **SET** key on the control panel functions as a point-and-select device (similar to a computer mouse) when used with the trackball. To select an on-screen object such as a button or a ▶ symbol, roll the trackball to position the pointer (cursor) on the object and then press the **SET** key on the control panel.

In this manual, the term "select" or "click" describe the trackball and **SET** key action required to select an on-screen object. In the example below, phrases A, B, C, and D are equivalent actions.

A. Roll the trackball to the **Search** button and then press the **SET** key.

B. Select the **Search** button.

C. Click the **Search** button.

D. Click **Search**.

## Special Terms and Menu Options

Special terms are indicated in boldface italics and are accompanied by a brief description on their first use in the manual.

*Example:* Provides on-screen anatomical graphics of ***pictograms*** that indicate the anatomy under evaluation.

Within a procedure, options in the system presets are identified in text as boldface type.

*Example:* Highlight the **Keyboard – Annotation** option.

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## [2] Instructions for Use


| Chapter Title | Chapter Description |
|---|---|
| **Chapter A1**<br>**Imaging Functions** | Procedures for general imaging functions, including Annotations and how to create QuickSets™. |
| **Chapter A2**<br>**2D-Mode and M-Mode Imaging Functions** | Description of the imaging functions for 2D-mode and M-mode imaging. Includes an explanation of the Ensemble™ Tissue Harmonic Imaging option. |
| **Chapter A3**<br>**CINE** | Information on how to review CINE data, either frame by frame or as a continuous display. |
| **Chapter A4**<br>**Biopsy** | Description of the biopsy (puncture) guidelines on the ultrasound system, including the needle path verification procedure. |
| **Chapter B1**<br>**Measurements and Calculations** | Step-by-step procedures for using the Measurement function. The procedures that apply to all exam types, including the report feature, are described first. |
| **Chapter B2**<br>**Obstetrical Measurements and Calculations** | Description of the features and calculations specific to the Obstetrical package, including fetal cardiac measurements. |
| **Chapter B3**<br>**Emergency Medicine Measurements and Calculations** | Description of the features and calculations specific to the Emergency Medicine (EM) package, including the report-specific information for:<br>▪ **FAST** (Focused Abdominal Sonography in Trauma)<br>▪ **Aorta**<br>▪ **Gallbladder**<br>▪ **Renal**<br>▪ **Obstetric**<br>▪ **Cardiac**<br>▪ **Bladder**<br>▪ **DVT** (Deep Vein Thrombosis). |
| **Chapter B4**<br>**Urology and Rectal Measurements and Calculations** | Description of the features and calculations specific to the Urology and Rectal packages. |
| **Chapter B5**<br>**Cardiac Measurements and Calculations** | Description of the features and calculations specific to the Cardiac package. All measurement functions for a Cardiac exam are detailed in this chapter. |
| **Chapter C1**<br>**Transducer Accessories** | Attachment procedures for transducer accessories. |
| **Chapter C2**<br>**Endo-V II Transducer** | Description of the Endo-V II transducer and the Endo-V II needle guide bracket kit. |
| **Chapter C3**<br>**Endo-P II Transducer** | Description of the Endo-P II transducer and the Endo-P II needle guide bracket kit. |


**Note:** Not all features and options described in this publication are available to all users. Please check with your Siemens representative to determine the current availability of features and options.

# A1 Imaging Functions

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# Annotation

You can use four methods to annotate an image.

- Direct text entry using the keyboard
- Predefined labels for positions and anatomical structures
- Pictograms of anatomical structures
- Arrow keys

**System Reference**

System Presets Ch 3

To remove annotation from the image screen, use the **F12** key. You can program the system to automatically delete on-screen annotation each time you use the **FREEZE** key to unfreeze the image. Use the system presets to specify whether all text or all pictograms are deleted at unfreeze.

**F4**

General
▶Delete Text on Unfreeze
General
▶Delete Pictogram on Unfreeze

The default position for the annotation cursor on the image screen is in the location defined by the**F11**(Home Set) key.

Once you have annotated an image during a patient examination, the system remembers the last position of the cursor; press the **SELECT** control to redisplay the annotation cursor.

**To reposition an annotation:**

1. During the annotation function, roll the trackball to position the cursor on the text, label, or arrow.
2. Press the **SET** key to select the annotation.
3. Roll the trackball to reposition the annotation and then press the **SET** key.

**To delete a single annotation:**

1. During the annotation fuction, roll the trackball to position the cursor on the text, label, or arrow.
2. Press the **SET** key to select the annotation.
3. Press the **F12** key on the keyboard.

**To change the font size:**

1. During the annotation function, select the menu category at the top of the menu and then select **Others**.
2. Select **Font Size** and rotate the **SELECT** control or press the **SET** key to display the desired setting.

   The system applies the selected setting to direct text entry and annotation labels. The new font size does not affect existing annotations.
3. To exit the menu, press the **MENU** key or the **TEXT** key.

**To hide text:**

- Press the **F13** key to toggle the display of the text on or off.

# Direct Text Entry

Use the keyboard to enter text directly onto the image area.

**To activate text entry:**

1. Press the **TEXT** key on the control panel.

   The system places the text cursor on the image screen.

2. To reposition the text cursor, roll the trackball.
3. Use the keyboard to enter text.
4. To exit the text entry function, press the **TEXT** key on the control panel.
   To exit the text entry function and delete all text, press the **ESCAPE** key on the control panel.

# Labels for Position and Anatomical Structures

Each exam type has labels for anatomical structures, imaging views, and body positions that can display as onscreen selections when the exam type is active. The labels are stored in libraries. Use the system presets to customize the text for anatomical structures, for imaging views and for body positions. You can:

- Add, replace, or delete onscreen menu labels
- Change the spelling or abbreviation of the labels
- Establish the order in which the labels display in the onscreen menu
- Reset the library to the original system-defined labels

**System Reference**

System Presets Ch 3

**F6**

Default Settings
▶Text Annotation
▶▶ Anatomy or Position

**To annotate using a predefined label:**

1. During the annotation function, roll the trackball to position the text cursor at the location for a label to display and then press the **MENU** key.
2. Select the menu category at the top of the menu and then select **Anatomy** or **Position**.

   The system displays the list of labels corresponding to the selected menu category.
3. Select the required label and then press the **SET** key.

   The system inserts the label at the cursor's position.
4. For each additional label, reposition the cursor, select another label, and press the **SET** key.

   **Note:** You can place a combined total of 24 labels and arrows on the image screen.
5. To delete the last label from the screen, press the **F12** key on the keyboard. Each press of the **F12** key deletes a previous label. To delete all annotations from the screen, press the **F14** key.
6. Press the **TEXT** key on the control panel to exit annotation. Press the **ESCAPE** key to exit and delete the labels.

# Directional Arrows

You can place arrows on-screen by first pressing the **TEXT** key on the control panel or the **F9** key on the keyboard.

**To place an arrow on the image screen:**

1. Press the **F9** key.

   The system displays an arrow on the image screen.

2. Roll the trackball to position the cursor at the required location for the arrow.

   **Note**: If you are adding an arrow immediately after entering text or a label, roll the trackball away from the text before adding the arrow.

   **Note:** You can place a combined total of 24 labels and arrows on the image screen.

3. To change the direction of the arrow, rotate the **SELECT** control on the control panel.

4. To change the size of the arrow, select **Arrow Size** in the **Others** menu.

   **Note:** If the menu is not displayed, select the menu category at the top of the menu and then select **Others**.

5. To save changes to the arrow's direction and size, press the **SET** key.

6. To delete an arrow, press the **F12** (Delete Word) key.

7. To exit the arrow function and retain all the arrows and labels, press the **F9** key on the keyboard or the **TEXT** key on the control panel. To exit the arrow function and erase all arrows and labels, press the **ESCAPE** key.

# Pictograms

Pictograms are graphics that display on-screen to indicate the anatomical structure under evaluation and to indicate the orientation of the transducer to the structure. You can rotate fetal pictograms to indicate the orientation of the fetus in utero.

Use the system presets to assign pictograms to each exam type. When the exam is active, pressing the **PICTOGRAM** key causes the assigned pictograms to display at the bottom of the image screen. One pictogram can display on an image. In Dual-mode and 4B-mode, you can display one pictogram for each image.

The selected pictogram for an image will display until you press the **ESCAPE** key, select a new pictogram, or begin a new exam. Use the system presets to automatically remove a pictogram when you unfreeze an image.

**System Reference**

System Presets Ch 3

**F6**

Default Settings
▶Pictogram List
General
▶Delete Pictogram on Unfreeze

**To display a pictogram:**

1. Press the **PICTOGRAM** key.

   The system displays the available pictograms for the active exam type.

2. To select a pictogram, roll the trackball to outline the pictogram and then press the **SET** key.

   The selected pictogram displays with a transducer orientation indicator in the lower left of the image.

3. Roll the trackball to position the transducer orientation indicator.

   a. To rotate the indicator, rotate the **SELECT** control.

   b. To anchor the position of the indicator, press the **SELECT** control.

4. To rotate a fetal pictogram, press and then rotate the **SELECT** control.

5. To redisplay the list of pictograms, press the **MENU** key.

6. To remove a pictogram from the screen, press the **ESCAPE** key while the trackball is assigned to the pictogram function.

**[1] Instructions for Use**

Trackball assignment Ch 3

# QuickSet Feature

The QuickSet™ feature allows you to capture an optimized configuration of imaging parameter settings for a specific transducer and exam. The system stores this configuration in a file known as a ***QuickSet***.

When a QuickSet is selected as the current exam type, the system activates the associated transducer and resets all imaging functions according to the stored configuration.

Use the system presets to change the default settings for an existing QuickSet.

## Creating a QuickSet

You can have a maximum of 32 QuickSets on the system at one time. If you attempt to create a new QuickSet, or load a saved QuickSet from disk after the maximum of 32 is reached, the system requires you to delete one or more existing QuickSets to accommodate the new ones.

**To create a QuickSet:**

1. Adjust the image parameter settings as required and then press the **F8** function key on the keyboard.

   The system displays a screen for saving and deleting QuickSets.

2. Roll the trackball to the **QuickSet Name** field and then press the **SET** key.

3. Use the keyboard to enter up to 20 characters for the name of the QuickSet.

4. Save the name by either rolling the trackball to the **Save** button and pressing the **SET** key or by pressing the **ENTER** key on the keyboard.

   The system displays the image screen and activates the QuickSet you created.

**System Reference**

System Presets Ch 3

**F6**

QuickSet Parameters

**To overwrite an existing QuickSet with the current image parameter settings:**

1. Adjust the image parameter settings as required and then press the **F8** function key.

   The system displays a screen for saving and deleting QuickSets.

2. Roll the trackball to an existing QuickSet and then press the **SET** key.

3. Roll the trackball to the **Save** button and then press the **SET** key.

   The system displays a message asking if you want to overwrite the QuickSet.

4. Roll the trackball to the **OK** button and then press the **SET** key to assign the new QuickSet configuration to the existing name.

**To delete an existing QuickSet:**

1. Press the **F8** function key.

   The system displays a screen for saving and deleting QuickSets.

2. Roll the trackball to an existing QuickSet and then press the **SET** key on the control panel.

3. Roll the trackball to the **Delete** button and then press the **SET** key on the control panel.

   The system removes the highlighted name from the list of QuickSets. If you attempt to delete a QuickSet when it is the current exam type, the system displays a message stating that you cannot delete a QuickSet currently loaded on the system.

# Activating a QuickSet

A QuickSet is a user-defined variation on a system-defined exam type.

**System Reference**

| | |
|---|---|
| System Presets | Ch 3 |
| Disk Function | Ch 4 |
| Preset/QuickSet Utility | Ch 5 |

**To select a QuickSet exam type:**

1. Press the **F5** function key to access the **Exam & QuickSet List**.
2. Roll the trackball to the name of a QuickSet.
3. Press the **SET** key.

**Note:** When a QuickSet is selected as the current exam type, the system activates the associated transducer and resets all imaging functions according to the stored configuration.

# Saving a QuickSet

You can save a QuickSet to a disk using the Preset/QuickSet utilities.

**F6**

Customize Keys

# 2D-Mode and M-Mode QuickSets

A QuickSet includes the following 2D-mode and M-mode parameters:

| 2D-mode | M-mode |
|---|---|
| ▪ Gain<br>▪ Persistence<br>▪ Gray Map<br>▪ Dynamic Range<br>▪ Edge Enhancement<br>▪ Field of View<br>▪ Transmit Power<br>▪ Depth (mm)<br>▪ Line Density<br>▪ Focal Zones<br>▪ Initial Frequency (MHz)<br>▪ Rotate<br>▪ Flip (L/R)<br>▪ Reject<br>▪ Res/Speed<br>▪ Scan Angle (Endo-V II transducer)<br>▪ SynAps (Synthetic Aperature)<br>▪ Frequency<br>▪ Steer<br>▪ Focus<br>▪ THI (Tissue Harmonic Imaging) settings | ▪ Sweep Rate<br>▪ Dynamic Range<br>▪ Edge Enhancement<br>▪ Reject<br>▪ Gain<br>▪ Gray Map<br>▪ Transmit Power |

# A2 2D-Mode and M-Mode Imaging Functions


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# Activating 2D-Mode

2D-mode is the default imaging mode for the ultrasound system. 2D indicates two-dimensional (2D) grayscale imaging. When you first power on the system, 2D-mode is active.

**To access 2D-mode from another imaging mode:**

- Press the **2D** control on the control panel.

  The system displays in 2D-mode (full screen).

**Note:** When operating in mixed modes (for example, 2D-mode with M-mode), pressing the **2D** control deactivates M-mode and displays full-screen 2D-mode imaging.

# Imaging Menu

During 2D-mode or M-mode imaging, you can use selections in the Imaging menu to adjust the settings for imaging parameters.

**To display the 2D-mode Imaging menu:**

1. Press the **MENU** key on the control panel.

   The system displays the default menu or the menu last viewed.

2. To change the displayed menu, roll the trackball to highlight the menu category at the top of the menu on the left of the screen. Example: **M ▶**.

   The system displays the list of available menu categories. If the image is live, the CINE menu is not available.

3. Roll the trackball to **2D** and then press the **SET** key.

   The system displays the 2D-mode menu.

4. Adjust imaging parameters using selections in the menu using the trackball with the **SELECT** control or **SET** key located on the control panel.

5. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# 2D-Mode Formats

You can display 2D-mode images in different formats: Split, Dual and 4B modes. Imaging capability in 2D-mode, M-mode, A-mode, and mixed modes is available.

*Active image indicator.*

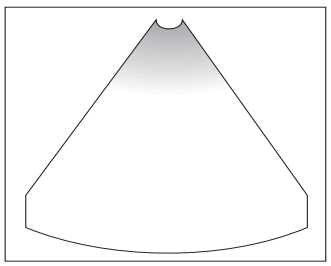
## Mixed-Mode Formats

- 2D/M-mode

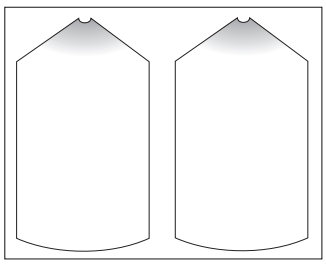
## Active Image

*Inactive image indicator.*

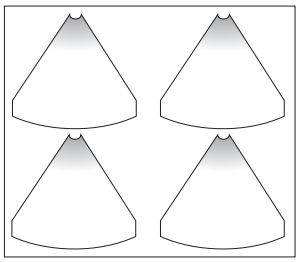
In Split, Dual, and 4B modes, while more than one 2D-mode image displays on the monitor, you can adjust imaging parameters for one image at a time. This image is the ***active*** image. The system indicates the active image with the active image indicator.



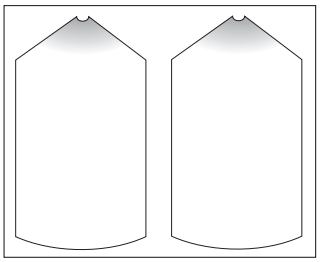
*Standard 2D-mode.*



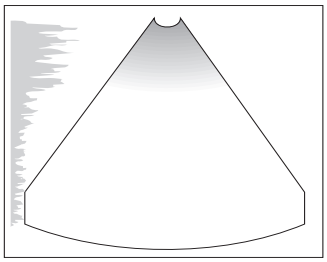
*Dual-mode.*



*4B-mode.*



*Split (B+B) mode.*



*2D-mode with A-mode.*

# Activating Split Mode

**[2] Instructions for Use**

Imaging Parameters A2-13

Split mode creates side-by-side images from one 2D-mode image. The two images are simultaneously frozen or real-time. Split mode is available with all transducers.

When you first initiate Split mode, the image parameter settings from the previous mode are applied to both images. Certain imaging parameters (such as Gray Map, A-mode, Reject, and Modify Map) can be changed in the right image, allowing comparison of the effects of different image settings on an anatomical structure.

**To activate Split mode:**

1. From a 2D-mode image display, press the **SPLIT** key on the control panel.

   The left image is the reference image.

2. To display the full-screen 2D-mode image, press the **SPLIT** key or the **2D** control on the control panel.
3. To simultaneously freeze both images, press the **FREEZE** key on the control panel.
4. To exit Split mode, press the **2D** control.

# Activating Dual-Mode

**[2] Instructions for Use**

Imaging Parameters A2-13

In Dual-mode, two acquired 2D-mode images display side-by-side on the image screen. Both images are obtained separately, and only one image displays in real-time.

When you first activate Dual-mode, the imaging settings from the previous mode are applied to the first image. The second image retains the same settings as the first image.

You cannot activate M-mode while Dual-mode is active. You cannot activate Dual-mode while 2D/M-mode is active.

**To activate Dual-mode:**

1. Press the left **DUAL/SELECT** key on the control panel to display an image on the left side of the screen, or press the right key to display an image on the right side of the screen.

   Only one image can be active at a time. The active image is indicated by the lighting intensity of the selected key and by the active image indicator.

2. To generate a second image, press the other **DUAL/SELECT** key.

   The system freezes the active image and activates a second image.

3. To display a full screen image, press the key for the active image a second time. Press the key again to restore the side-by-side display.
4. To inactivate the current image and activate the other image in a side-by-side display, press the **DUAL/SELECT** key.

   The system shifts the active image indicator to the selected image and freezes both images.

5. Press the **FREEZE** key to unfreeze the Dual-mode display.
6. To exit Dual-mode, press the **2D** control on the control panel.

# Activating 4B-Mode

In 4B-mode, four separately acquired 2D-mode images display on the image screen. Only one image can display in real-time.

When you first activate 4B-mode, the imaging settings from the previous mode are applied to the first image. Subsequent images retain the same settings as the previous image.

**To activate 4B-mode:**

1. From a 2D-mode display, press the **4B** key on the control panel.

   The first image displays in the upper left quadrant of the screen. This is the active image, as identified by the brightened active image indicator.

2. Press the **FREEZE** key.

   The image is frozen in position and a second image displays in the next available quadrant.

3. To continue to place images, press the **FREEZE** key.
4. To cycle through the images, first freeze the active image and then press the **4B** key. To display the active image in real-time, unfreeze the system.
5. To exit 4B-mode, press the **2D** control.

# Activating A-Mode

**Important:** At the time of publication, A-mode was not cleared for use by the U.S. Food and Drug Administration. Before using A-mode, check the current regulations for the country in which you are using this system to determine if A-mode is cleared for use.

A-mode is available in 2D-mode. A-mode displays in real-time or displays on a frozen image.

Once activated, A-mode displays even when you change modes. If you enter into a mode that does not support A-mode, the A-mode display is removed. When you activate a mode that does support A-mode, the display and cursor return.

**To display A-mode:**

1. Press the **MENU** key on the control panel to display the 2D-mode Imaging menu when 2D-mode is active.
2. Roll the trackball to **A-mode** on the 2D-mode menu and press the **SET** key to toggle the setting to **On**.

   The system places an A-mode cursor in the image. The location of the cursor designates the region of sampling.
3. Roll the trackball to position the cursor on the image.

   The echo amplitude displays along the depth scale on the image.
4. To remove A-mode from the image, highlight **A-Mode** in the 2D-mode Imaging menu and then press the **SET** key to toggle the setting to **Off**.
5. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Activating M-Mode

When you first activate M-mode, the M-mode cursor displays on the 2D-mode image. This cursor is a graphical representation of the acoustic line along which the M-mode information is gathered. The cursor displays as a row of dots representing depth.

**System Reference**

System Presets Ch 3

## Simultaneous Format

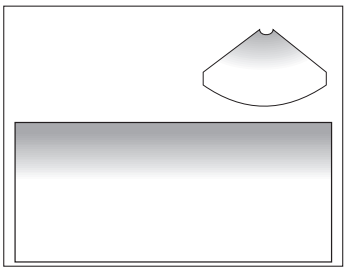
During 2D/M-mode, the 2D-mode image and M sweep display simultaneously in real-time or are simultaneously frozen.

## M-Mode Formats

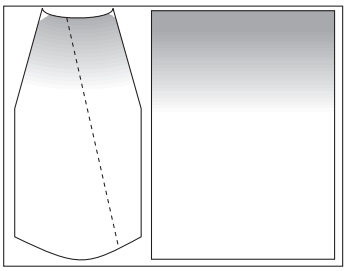
Use the system presets to select your preference of a 2D/M-mode imaging format.

**F6**

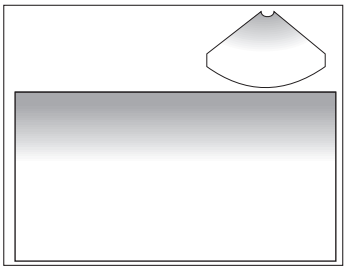
Default Settings
▶2D/M Display Format



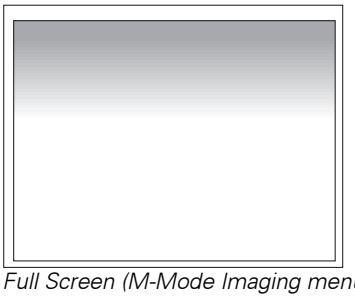
*½-½ horizontal.*



*40/60 vertical.*



*1/3-2/3 horizontal.*



*Full Screen (M-Mode Imaging menu Selection).*

# 2D/M-Mode Display and Update

Curved array and linear array transducers allow a 2D-mode image and an M-mode sweep to display simultaneously in real-time.

### To activate M-mode, 2D/M-mode, or Split/M-mode:

**Prerequisite:** For Split/M-mode, you must use the system presets to select either the **1/3 – 2/3** or **½ – ½** display format.

1. Press the **M** key on the control panel.

   **Note:** If the cursor bypass is selected in the system presets, the system activates 2D/M-mode immediately; proceed to step 4. If the cursor bypass is not selected, the system initially displays an M cursor on the 2D-mode image.

   The ***M cursor*** is a graphical representation of the acoustic line along which M-mode information is gathered.

2. Roll the trackball to position the **M** cursor.
3. To activate 2D/M-mode, press the **M** key a second time.

   The system displays a 2D-mode image and an M-mode sweep in the format selected in the system presets. Use the trackball to reposition the M-mode cursor on the 2D-mode image.

4. To activate Split/M-mode, first activate 2D/M-mode and then press the **SPLIT** key on the control panel.

   The system displays two 2D-mode images with the M-mode sweep.

5. To display a full-screen M-mode sweep, display the M-mode Imaging menu, roll the trackball to **Full M** and then press the **SET** key to toggle **Full M** with **2D/M**.

   **Note:** While a 2D/M-mode display is in freeze, you can press the left **DUAL/SELECT** key to toggle a full-screen 2D-mode display on or off, and you can press the right **DUAL/SELECT** key to toggle a full-screen M-mode display on or off.

6. To exit full-screen M-mode or 2D/M-mode, press the **2D** control on the control panel.

**System Reference**

System Presets Ch 3

**F6**

Imaging
▶ Update Frames in 2D/M
Default Settings
▶ 2D/M Display Format
Default Settings
▶ Bypass M Cursor Display

# Changing the M-Mode Sweep

You can adjust the scrolling speed of the M-mode sweep, activate time markers on the sweep, and specify sweep offset.

## Scrolling Speed

You can choose from four sweep speeds: **2sec**, **4sec**, **8sec**, and **16sec**. The sweep rate displays in the lower left of the sweep.

The sweep scrolls from the left of the image screen to the right.

**To adjust the scrolling speed of the M-mode sweep:**

1. Display the M-mode Imaging menu.
2. Roll the trackball to **Sweep Sp**.
3. Rotate the **SELECT** control or press the **SET** key to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

## Time Markers

Time markers are available for display in the M-mode sweep. Use the system presets to activate the markers. The vertical markers display in intervals in a fixed location on the sweep.

## Offset

In 2D/M-mode with a 1/3-2/3 or 1/2-1/2 horizontal sweep, you can **offset** the 2D-mode image and the M-mode sweep to display specific information more fully on-screen.

**System Reference**

System Presets Ch 3

**F6**

Display
▶Time Marker Display
Default Settings
▶2D/M Display Format

**[2] Instructions for Use**

Offset A2-28

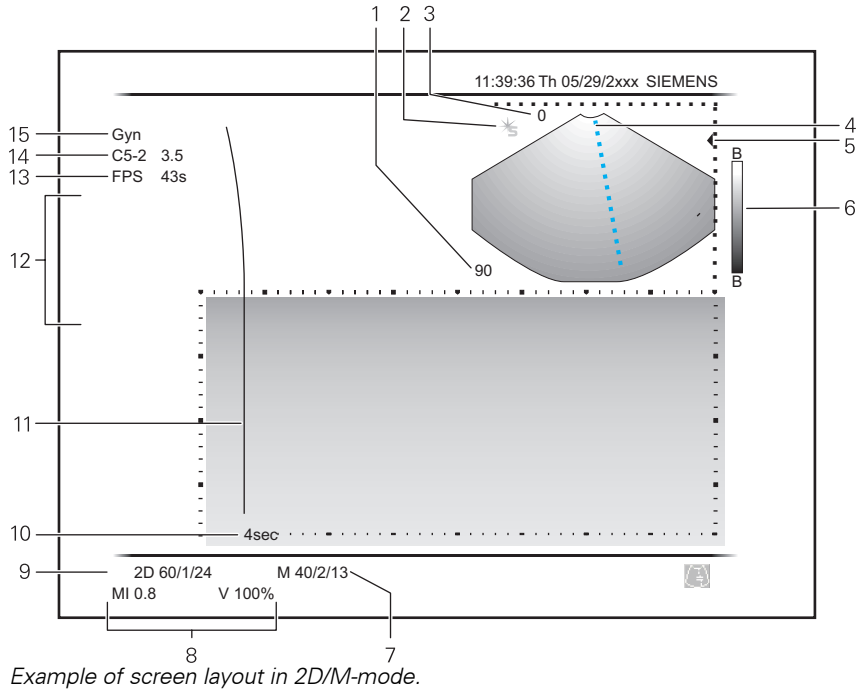
# 2D/M-Mode ▪ Example Screen Layout

The active exam type, transducer, transducer frequency, frames per second, and line density display in the upper left of the image screen. The values of particular imaging parameters display by imaging mode at the bottom of the image screen in the ***Imaging Parameters***.

When Dual-mode or 4B-mode is selected, the values display only for the active image. If the image is frozen, the values indicate the setting at the time the image was in real-time. If the system is in 2D/M-mode, both the 2D settings and the M settings are displayed.

**[1] Instructions for Use**

| | |
|---|---|
| Transmit Power | Ch 2 |
| MI/TI Indices | Ch 2 |




*Example of screen layout in 2D/M-mode.*

1 Imaging depth in mm
2 Active image indicator
3 Offset value (in mm) – displays when **Offset** is **On**
4 M-mode cursor
5 Focal zone marker
6 Gray bar
7 M-mode Imaging Parameters indicating dynamic range, edge enhancement, and gain
8 Transmit Power and MI/TI indices
9 2D-mode Imaging Parameters indicating dynamic range, edge enhancement, and gain
10 Sweep rate
11 DGC curve
12 Location of Imaging menu
13 Frames per second and line density
14 Active transducer name and frequency
15 Active exam type

## Imaging Parameters Legend

**2D: 60 / 1 / 24** = 2D-mode: Dynamic Range / Edge Enhancement / Gain

**M: 40 / 2 / 13** = M-mode: Dynamic Range / Edge Enhancement / Gain

# Imaging Parameters

When the system displays multiple images, changing the imaging parameters may affect all images or only the active image.

**Note:** Frequency, line density, and scan width are transducer-dependent. Also, full-screen M-mode does not support the functions that apply only to 2D-mode images.

**[2] Instructions for Use**

Creating a QuickSet Ch A1

**System Reference**

System Presets Ch 3

| Imaging Parameters | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dual-mode | | Split-mode | | 4B-mode | | 2D/M-mode | |
| **Parameter** | **2D-mode** | **Active** | **Both** | **Active** | **Both** | **Active** | **All** | **2D** | **M** |
| Transmit Power | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| 2D Gain | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Depth | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| Depth Gain Compensation | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| Focus | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Frequency | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| M Gain | | | | | | | | | ✓ |
| L/R Flip | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Scan Width | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Transducer type | ✓ | | ✓ | | ✓ | | | ✓ | ✓ |
| Rotate | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| Zoom (Magnify) | ✓ | ✓ | | ✓ | | ✓ | | ✓ | ✓ |
| Dynamic Range | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Persistence | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Edge | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Res/Speed | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Reject | ✓ | ✓ | | ✓ | | | | ✓ | |
| Steer | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| FOV/POS | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| Offset | ✓ | ✓ | | | ✓ | | | ✓ | ✓ |
| Gray Map | ✓ | ✓ | | ✓ | | ✓ | | ✓ | |
| Line Density | ✓ | ✓ | | | ✓ | ✓ | | ✓ | |
| SynAps | ✓ | ✓ | | | ✓ | | | ✓ | |
| THI | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |

# Changing a Transducer Frequency



Use the **MULTIHERTZ** control to change the operating frequency of an active transducer.

The system displays the name of the active transducer and operating frequency in the upper left of the image screen.

*Example of active transducer and operating frequency.*

**Note:** During THI imaging, the system displays the frequency followed by a T.

*Example of active transducer and operating frequency for THI imaging.*

**To change the transducer frequency:**

- Push the **MULTIHERTZ** control on the control panel up to increase the frequency or down to decrease the frequency.

  Selecting a higher frequency typically increases resolution, whereas selecting a lower frequency improves penetration.

# Changing the Imaging Depth

Maximum and minimum depth selections are dependent upon the frequency of the transducer you are currently using. Depth is adjustable in 10-mm increments.

Use the system presets to assign the direction of rotation (clockwise or counterclockwise) for increasing a value when using the **DEPTH/ZOOM** control. This assignment affects both the depth and zoom parameters.

**To change the imaging depth:**

- Rotate the **DEPTH/ZOOM** control on the control panel.

  The imaging depth displays at the bottom left of the image screen. When you are using 2D-modes with more than one 2D-mode image, the depth value displays for both 2D-mode images. In Split-mode, rotating the **DEPTH/ZOOM** control changes the depth for both 2D-mode images. In Dual-mode and 4B-mode, rotating the **DEPTH/ZOOM** control changes the depth for the active image.

**System Reference**

System Presets Ch 3

**F6**

Customize Keys
► Zoom/Depth Direction

# Adjusting the Overall System Receiver Gain

You can adjust the echo amplification and brightness of a 2D-mode image or for an M-mode sweep. Rotating the **2D** control changes the overall receiver gain for the last active mode, 2D-mode or M-mode.

**[2] Instructions for Use**

Example Screen Layout A2-12

The range for gain is 0 dB to 40 dB in 1-dB increments. When combined with the DGC Gain, a range of –15 dB to 55 dB is possible.

The gain value displays in the Imaging Parameters at the bottom of the screen. When you are viewing Dual-mode or 4B-mode with more than one image, the value displays only for the active image. In 2D/M-mode, separate gain values display for the 2D-mode image and the M-mode sweep.

| | | | |
|---|---|---|---|
| **2D:** | **55/** | **1/** | **32** |

| | | | |
|---|---|---|---|
| **M:** | **35/** | **2/** | **29** |

*Gain (dB) is indicated by the shaded value.*

**To adjust the overall gain for 2D-mode:**

- During 2D-mode imaging, rotate the **2D** control on the control panel clockwise to increase the gain or counterclockwise to decrease the gain.

**To adjust the overall gain for M-mode:**

- During M-mode imaging, rotate the **2D** control on the control panel clockwise to increase the gain or counterclockwise to decrease the gain.

# Adjusting the Depth Gain Compensation (DGC)

**System Reference**

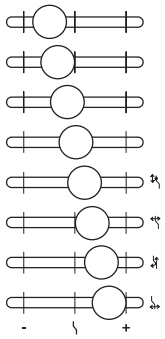
System Presets Ch 3

To compensate for weak signals or over-bright signals at various depths, you can adjust Depth Gain Compensation (DGC) using the DGC slide controls. The **2D** control adjusts the overall receiver gain and compensates for the brightness of the image.

The DGC provides eight slide controls for adjusting image quality during real time imaging. Move each slide control to the right to increase the gain or to the left to decrease the gain over a 30-dB range.

**F6**

Display
▶DGC Curve Display
General
▶DGC Invert With Image Invert




*DGC Slide Controls.*

Use the system presets to turn on the display of the DGC curve. The curve provides an on-screen representation of the DGC settings.

In 2D/M-mode, DGC adjustments affect both the 2D-mode image and the M-mode sweep.

The DGC slide controls have no effect during CINE.

**To adjust the DGC slide controls:**

- Move a slide control to the right to increase a setting or to the left to decrease a setting.

# Changing the Dynamic Range

**[2] Instructions for Use**

Example Screen Layout A2-12

You can adjust the overall contrast resolution of a 2D-mode image and the overall contrast resolution of an M-mode sweep. For 2D-mode, the dynamic range values are 35 dB to 70 dB in 1-dB increments. For M-mode, the same range of values is available, but in 5-dB increments.

The dynamic range value displays in the Imaging Parameters at the bottom of the screen. In Dual mode or 4B-mode with more than one image, the value displays only for the active image. In 2D/M-mode, separate dynamic range values display for the 2D-mode image and the M sweep.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **2D:** | **55/** | **1/** | **32** | **M:** | **35/** | **2/** | **29** |

*Dynamic range (dB) is indicated by the shaded value.*

**To change the dynamic range for 2D-mode:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **DR**.
3. Rotate the **SELECT** control on the control panel to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

**To change the dynamic range for M-mode:**

1. Display the M-mode Imaging menu.
2. Roll the trackball to **DR**.
3. Rotate the **SELECT** control on the control panel to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Adjusting the Focus

You can select the number of focal zones and then position their markers on the image screen. Focal zone markers display on the left side of the image area.

Curved array and linear array transducers support multiple transmit focus points which you can select and position in the image.

Split images both have the same number and position of focal zones. In Dual-mode and 4B-mode, it is possible to have a different number and position of focal zones in each image. During M-mode, only one focal zone is available.

## Single Focal Zone

When you select one (1) focal zone, pushing the **FOCUS** control positions the focal zone marker, regardless of scan depth.

## Multiple Focal Zones

When you select two (2) or four (4) focal zones, the spacing between the focal zones adjusts automatically. Pushing the **FOCUS** control adjusts the relative position of the focal zone markers within the field of view. Available positioning depends upon your selected depth.

Using multiple focal zones causes a reduction in the frame rate. The amount of frame rate reduction depends on the depth of view and transducer.

**To select the number of focal zones:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Focus**.
3. Rotate the **SELECT** control or press the **SET** key to adjust the setting.
4. To position the focal zones, push up or down on the **FOCUS** control on the control panel.
5. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Changing the Line Density

Use the **Density** 2D-mode Imaging menu selection to increase or decrease the number of acoustic scan lines per frame for 2D-mode images. Increasing the line density improves image detail and decreases the frame rate. Frame rate is also dependent on the image width and the imaging depth.

The line density setting displays next to the frame rate in the upper left of the image screen. Selections for line density are:

| Menu Setting | Definition | Onscreen display |
|---|---|---|
| Std | Standard | s |
| Hi | High | h |

**To change the line density setting:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Density**. It may be necessary to access page 2 of the menu.
3. Rotate the **SELECT** control or press the **SET** key to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

**[2] Instructions for Use**

Depth A2-14
Field of View A2-24

# Maximizing Resolution and Speed

You can adjust the balance between the scan line density (resolution) and the synthetic aperture using the **Res/Speed** 2D-mode Imaging menu selection.

| Res/Speed Setting | Line Density (Resolution) | Synthetic Aperture | Frame Rate |
|---|---|---|---|
| Std | Std | Off | Full rate |
| Dtl | High | Off | 1/2 rate |
| Far | Std | On | 1/2 rate |

**To change the Res/Speed:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Res/Speed**.
3. Rotate the **SELECT** control to adjust the resolution and speed.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Synthetic Aperture

Use the **SynAps** 2D-mode Imaging menu selection to increase the receiving aperture by transmitting twice on the same image line. This technique results in improved resolution, greater penetration at depth, and reduced frame rate. The **SynAps** selection is available only when the **Res/Speed** setting is **Far**.

**To change the synthetic aperture:**

1. Display the 2D-mode Imaging menu.
2. Confirm **Far** is selected for **Res/Speed**.
3. Roll the trackball to **Syn/Aps**. It may be necessary to access page 2 of the menu.
4. Press the **SET** key to toggle the setting to **On** or **Off**.
5. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Changing the Persistence

Persistence provides a visible smoothing effect to the 2D-mode image by persisting lines of image data for each frame of imaging.

**To change persistence:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Persistence**.
3. Rotate the **SELECT** control to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Changing the Edge Enhancement

Use the **Edge** 2D-mode or M-mode Imaging menu selection to distinguish the contours of a structure during real-time imaging. The range of values for edge enhancement is from **0** (none) to **5** (maximum).

**[2] Instructions for Use**

Example Screen Layout A2-12

The edge enhancement value displays in the Imaging Parameters at the bottom of the screen. In Dual mode and 4B-mode, the value displays only for the active image. In 2D/M-mode, the value displays for both the 2D-mode image and the M-mode sweep.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **2D:** | **55/** | **1/** | **32** | | **M:** | **35/** | **2/** | **29** |

*Edge enhancement is indicated by the shaded value.*

**To change edge enhancement:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Edge**.
3. Rotate the **SELECT** control to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Selecting a Gray Map

During real-time imaging or when the system is in freeze, select the active ***gray map*** or processing curve by using the **Gray Map** Imaging menu selection. The system assigns the echo amplitudes to gray levels according to the selected gray map.

The active gray map is depicted by a gray bar, which displays on the right side of the image screen. The gray bar represents the range of gray shades available for the selected map.

**To select a Gray Map:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Gray Map**.
3. Rotate the **SELECT** control to adjust the setting.

   The label of the selected gray map also displays below the gray bar.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

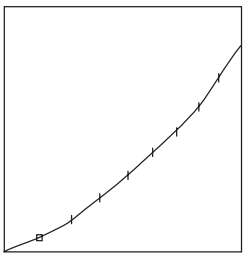
**[2] Instructions for Use**

Example screen Layout A2-12

*Example of a gray bar.*

# Modifying a Gray Map

Use the **Modify Map** 2D-mode Imaging menu selection to redistribute the range of echo amplitudes assigned to the range of available gray shades for the selected gray map. You can modify **E**, **S**, **D**, **A**, **C**, and **B** of the seven available gray maps during real-time imaging or when the system is in freeze. You can reposition the inflection points within a specific range. The system automatically recalculates the curve and updates the image.



*The ten inflection points of a processing curve. The cursor displays as a box, positioned here over the second point.*

**To modify the map:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Modify Map**.
3. Rotate the **SELECT** control to adjust the setting.

   The system overlays the selected map on the image screen.
4. Press the **SELECT** control on the control panel to activate the edit feature for the selected map.
5. Rotate the **SELECT** control on the control panel to select an inflection point.
6. Roll the trackball to reposition the inflection point.
7. Repeat steps 5 and 6 for each required inflection point.
8. After modifying the map:
   - To save the inflection point changes and continue modifying gray maps, press the **MENU** key.
   - To save the inflection point changes and resume imaging, press the **ESCAPE** key.

**To restore factory defaults for the selected Gray Map:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Reset Map**.
3. Press the **SET** key to reset the map to factory default settings.

   If the displayed map has been modified, the system prompts you to confirm the action.
4. Select **OK** to re-establish factory default inflection points for the selected map.
5. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

## Reject for 2D-Mode and M-Mode

Use the **Reject** 2D-mode or M-mode Imaging menu selection to eliminate the display of echoes below a designated level. The selected level displays on the gray bar from **0** (weak echoes) to **64** (strong echoes). Increasing the level removes low to high amplitude signals, and decreasing the level restores the display of high to low amplitude signals.

*Example of a gray bar with reject setting for 2D-mode.*

**To establish a 2D-mode or M-mode range of echo amplitudes:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **Reject**.
3. Rotate the **SELECT** control to adjust the setting.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

## Adjusting the Field of View

You can optimize the ***field of view*** (FOV) during real-time imaging.

- For curved array transducers, adjust the sector angle and position of the image.
- For linear array transducers, adjust the image width and steer the image through the left, center, and right positions.

The actual angle of the field of view is determined by the geometry of the transducer.

**To adjust the field of view for a curved array transducer:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **FOV/POS**.
3. Press the **SET** key to toggle the setting to **On**.

   The system assigns the trackball to adjustment of the sector angle.
4. Roll the trackball to the left to decrease or to the right to increase the sector angle of the image.
5. To reposition the field of view, press the **SET** key.

   The system assigns the trackball to adjustment of the FOV position.
6. Roll the trackball to the right or to the left to reposition the field of view.
7. To exit **FOV/POS** adjustment, roll the trackball to **FOV/POS** and then press the **SET** key.

**To adjust the field of view for a linear array transducer:**

1. Display the 2D-mode Imaging menu.
2. Roll the trackball to **FOV/POS**.
3. Press the **SET** key to toggle the setting to **On**.

   The system assigns the trackball to adjustment of the image width.
4. Roll the trackball to adjust the width of the image.
5. To steer the image, press the **MENU** key and then roll the trackball to **Steer**.
6. Rotate the **SELECT** control to adjust the setting.

   The system steers the image through the left, right, and center positions.
7. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

# Changing the Image Orientation

Change the scan direction of a transducer to horizontally flip a 2D-mode image using the **L/R FLIP** key. You can also rotate the 2D-mode image or the M-mode sweep so that the near field displays on the right, at the bottom, on the left, or on the top of the image screen by pressing the **SHIFT+L/R FLIP** keys. Each press of these keys rotates the image 90°.

## Horizontal Orientation

The active image indicator shows the scan beginning point. You can change the scan direction of a transducer by using the **L/R FLIP** key to toggle the horizontal orientation of the image, for example, from right-to-left or left-to-right.

*Active image indicator.*

| Mode | Effect of L/R |
|---|---|
| Split (B+B) mode | Simultaneously reverses both images |
| Dual-mode, 4B-mode | Reverses the active image only |

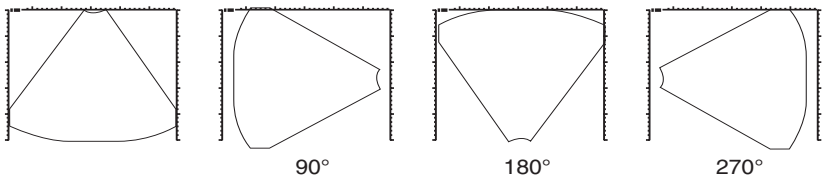
**To change the horizontal orientation of an image:**

- Press the **L/R FLIP** key on the control panel.

  The system changes the direction of the scan.

# Vertical Orientation

The conventional vertical orientation of an image is to display the near field at the top of the image screen. You can change the display orientation so that the near field displays at the right, bottom, or left of the image screen by using the **SHIFT+L/R FLIP** keys.




**Note:** Use the system presets to determine if the DGC curve inverts when you press the **SHIFT+L/R FLIP** keys.

| Mode | Effect of Rotate |
|---|---|
| Split (B+B) mode | Simultaneously rotates both images |
| Dual-mode, 4B-mode | Rotates the active image |

### To change the vertical orientation of an image:

- Press the **SHIFT+L/R FLIP** keys on the control panel.

  Each press of these keys rotates the image 90°.

**System Reference**

System Presets Ch 3

**F6**

General
▶DGC Invert with Image Invert

# Offsetting the Image

Use the 2D-mode **Offset** Imaging menu selection while imaging in 2D-mode to move the image area to the site of interest, vertically and/or horizontally. When an image is offset, the offset value displays in the upper left side of the image screen. When imaging in Dual-mode, offset values display only for the active image.

**[2] Instructions for Use**

Offset sweep A2-11

**System Reference**

System Presets Ch 3

**To scroll the image vertically and/or horizontally:**

1. Display the 2D-mode Imaging menu.
2. Offset the image.
   a. Roll the trackball to **Offset**.
   b. Press the **SET** key to toggle the setting to **On**.
   c. Roll the trackball to scroll the image vertically and/or horizontally.

      The amount of offset available depends on the selected transducer.
3. Disable the offset.
   a. Press the **MENU** key.
   b. Roll the trackball to **Offset**.
   c. Press the **SET** key to toggle the setting to **Off**.

      The system cancels the offset value and restores the normal image display.
4. Continue adjusting imaging parameters and then press the **MENU** key to exit the menu.

**F6**

Default Settings
▶2D/M Display Format

# Magnifying the Image

Use the **DEPTH/ZOOM** control on 2D-mode and M-mode images for magnification in real-time or freeze. Pressing the **DEPTH/ZOOM** control places an adjustable zoom window on the image screen. You can roll the trackball to position the window on the region of interest. Adjust the magnification factor by rotating the **DEPTH/ZOOM** control until the window is the appropriate size. Pressing **DEPTH/ZOOM** a second time will magnify the region of interest (ROI). You can reposition the ROI by rolling the trackball.

**System Reference**

System Presets Ch 3

Use the system presets to assign the direction of rotation (clockwise or counterclockwise) for increasing a value when using the **DEPTH/ZOOM** control. This assignment affects both the depth and zoom parameters.

**F6**

Customize Keys
▶Zoom/Depth Direction

You can perform the following actions using the Zoom function:

| To: | Perform this action: |
|---|---|
| Activate the zoom window | Press the **DEPTH/ZOOM** control. |
| Change the size of the zoom window and/or change the size of the magnified area | Rotate the **DEPTH/ZOOM** control. |
| Position the zoom window on the image | Roll the trackball. |
| Magnify the image (portion that displays in the zoom window) | Press the **DEPTH/ZOOM** control. |
| Cancel zoom and remove the zoom window from the active image | Press the **DEPTH/ZOOM** control again or use the **ESCAPE** key. |

## Magnifying Split Images

When using the Zoom function in a Split image, the image on the left displays the zoom window on the image indicating the area that is being magnified.

**To magnify a Split image:**

1. Press the **DEPTH/ZOOM** control.
2. Roll the trackball to position the zoom window over the region of interest in the image on the left.
3. Rotate the **DEPTH/ZOOM** control to adjust the size of the zoom window.
4. Press the **DEPTH/ZOOM** control.

   The image on the right increases magnification in the area indicated by the zoom window.
5. Rotate the **DEPTH/ZOOM** control to change the size of the zoom window.
6. Roll the trackball to reposition the zoom window and magnified area.
7. Press the **DEPTH/ZOOM** control to deactivate magnification.

## Magnifying a Dual Image

When using the Zoom function in a Dual image, it is possible to apply the function to one or both of the images. You can remove the Zoom function when the image is active.

**To magnify a Dual image:**

1. Activate Dual-mode images by first pressing the left **DUAL/SELECT** key and then pressing the right **DUAL/SELECT** key on the control panel.
2. Press the **DEPTH/ZOOM** control.

   The zoom window displays in the right (active) image.
3. Roll the trackball to position the zoom window over the region of interest in the active image.

4. Rotate the **DEPTH/ZOOM** control to adjust the size of the zoom window.
5. Press the **DEPTH/ZOOM** control.

   The selected portion of the image is magnified.
6. Press the left **DUAL/SELECT** key to switch the active image.

   The system switches the active image indicator to the left image and freezes both images.
7. Press the **FREEZE** key to unfreeze the active image.
8. Repeat steps 2 through 5 for the left image.
9. To display an image in normal magnification, unfreeze the image and then press the **DEPTH/ZOOM** key.

## Magnifying 2D/M-Mode Images

The 2D-mode image and M-mode sweep can be magnified simultaneously.

**To magnify the 2D-mode image and M-mode sweep at the same time:**

1. From 2D/M-mode, press the **DEPTH/ZOOM** control.
2. Roll the trackball to position the zoom window over the region of interest in the 2D-mode image.
3. Rotate the **DEPTH/ZOOM** control to adjust the size of the zoom window.
4. Press the **DEPTH/ZOOM** control.

   The portion of the image you selected and the M-mode sweep are magnified.

# Ensemble Tissue Harmonic Imaging

Ensemble™ Tissue Harmonic Imaging (THI) is a system feature that can enhance contrast resolution with fine tissue differentiation, benefiting difficult-to-image patients.

**[1] Instructions for Use**

Compatible Transducers Ch 6

THI creates 2D-mode images from the received signals using the harmonics of the transmitted (fundamental) frequency. Harmonics are multiples of the fundamental frequency. The system utilizes the harmonics produced in tissue by the non-linear propagation of an ultrasound wave. A pulse sequence technique is used to remove the fundamental signals without affecting the harmonic signals. The harmonic signals have a narrower main lobe and lower side lobes than fundamental 2D-mode signals, resulting in improved spatial and contrast resolution.

**To activate THI:**

1. Push up on the **MULTIHERTZ** control until a "T" displays next to the transmit frequency in the upper left of the image area.
2. To exit THI, push down on the **MULTIHERTZ** control until the "T" is removed from the screen.

# Optimizing Contrast Resolution and Brightness Uniformity (TGO)

The TGO™ Tissue Grayscale Optimization technology optional feature optimizes the image's contrast resolution and brightness uniformity by shifting low-level amplitude signals to the grayscale range optimal for viewing.

When you activate TGO, the system immediately optimizes the image's contrast resolution and brightness uniformity and displays the "TGO" symbol below the active image indicator to indicate that TGO is active. TGO remains active for the current examination until you exit TGO, end the current examination, or select another exam type or transducer.

For software versions 2.0 and higher: You can also select an offset (TGO gain) for preferred image brightness with TGO during the current examination (for the current exam type and transducer). The selected value represents the increments of gain adjustment to be added to or subtracted from the default optimized gain.

If you activate a 2D-mode imaging feature that supports TGO (such as THI), then the system automatically updates the optimization for that imaging feature. When you exit TGO, the system removes any gain adjustments you made while TGO was active and removes the "TGO" symbol from the screen to indicate that TGO is no longer active.

You can configure the following documentation controls for TGO activation:

- **DIGITAL STORE 1**
- **DIGITAL STORE 2**

**To activate TGO, choose one of the following methods:**

- During 2D-mode imaging, press the documentation control (**DIGITAL STORE 1** or **DIGITAL STORE 2**) configured for TGO activation.
- During 2D-mode imaging, press the **MENU** key on the control panel to display the 2D-mode menu and then select **TGO**.

**[1] Instructions for Use**

Configuring Documentation Controls Ch 4

**To select a TGO gain setting (offset):**

(Requires software version 2.0 or higher)

1. Activate **TGO**.
2. Press the **MENU** key on the control panel to display the 2D-Mode Imaging menu.
3. Roll the trackball to **TGO Gain** on the 2D-mode menu.
4. Rotate the **SELECT** control on the control panel or press the **SET** key on the control panel to cycle through the gain settings.

**To refresh TGO:**

**Note:** Siemens recommends limiting re-activations of TGO.

- Press the **MENU** key on the control panel to display the 2D-mode menu and then select **TGO Refresh**.

**To exit TGO:**

- While TGO is active, press the **MENU** key on the control panel to display the 2D-mode menu and then select **TGO**.

**[2] Instructions for Use**

Activating TGO A2-33
2D-Mode Imaging Menu A2-3

# A3 CINE

**CINE** ..... **3**
CINE Memory Buffer ▪ First In, First Out ..... 4
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# CINE

The CINE function is available in all imaging modes except 4B-mode. During real-time imaging, the system places the most recently acquired images as well as the image currently on screen into a CINE memory buffer. You can view images stored in CINE memory using a review method.

- **Frame Review** – The Frame function is the system default. Use the trackball to cycle through the frames of data, one at a time, either forward or backward. You can also use the Frame function to select individual frames for printing or for storing on a disk.
- **Motion Review** – The Motion function provides a continuous display of stored data, in the forward direction only. Data can be played back at the same frame rate at which the data was acquired, or the playback speed can be adjusted. All of the available frames can be viewed, or a segment can be selected using the Edit Start and Edit End options.

**[2] Instructions for Use**


| | |
|---|---|
| Storage Capacity | A3-4 |
| Frame Review | A3-8 |
| Motion Review | A3-9 |

# CINE Memory Buffer ▪ First In, First Out

You can review any or all of the image data in the CINE memory buffer. When the CINE memory buffer is filled, the first data acquired is the first to be replaced. This process of overwriting data is continuous. Unfreezing the system erases the data from the CINE memory buffer and restarts the acquisition of CINE data.

## Memory Buffer Capacity

The amount of storage available in the CINE memory buffer depends on the image complexity (setting for the **Density** onscreen menu option), mode combinations, and the active exam type.

### M-mode

The maximum CINE memory capacity for M-mode depends on the sweep speed. The capacities are the same for NTSC and PAL systems.

| Sweep Speed | Storage |
|---|---|
| 2sec | 65.536 seconds |
| 4sec | 131.072 seconds |
| 8sec | 262.144 seconds |
| 16sec | 524.288 seconds |

## Partially Filled Memory Buffer

If the acquired frames of CINE data do not fill the CINE memory buffer, the system displays a vertical marker on the CINE graphic, indicating how much of the CINE memory buffer is available for review.

*CINE data available for review.*

**Note:** If the memory buffer has been cleared and the system is not filled to capacity with CINE frames, only the newly-acquired frames are present.

# CINE Indicator

**[2] Instructions for Use**
Editing the loop A3-10

During CINE review, a ***CINE indicator*** displays in the lower right of the image screen. This CINE icon represents the status of the CINE memory buffer with the following information:

- Position of the currently displayed frame within the CINE data

*Arrow indicates location of frame within the loop of data.*

- During Frame Review of 2D-mode, the number of the active frame displays to the left of the CINE indicator on the image screen.

*Current frame number under review.*

- Identifies an edited segment in a loop of data

*Markers indicate the edited segment of CINE data using* **Edit Start** *and* **Edit End** *onscreen menu selections.*

# Activating CINE Review

The CINE memory buffer continuously accumulates data during real-time imaging. When CINE is activated, the accumulation process stops, and the data in the memory buffer is available for replay, printing, or storage to a disk medium.

CINE Review can be activated manually, or preset to activate when the system is frozen. Use the system presets to assign the **FREEZE** key to activate CINE.

**System Reference**

System Presets Ch 3

**F6**

Default Settings
► Automatic Freeze Response

### To activate CINE Review:

- If the automatic freeze response is set to CINE in the system presets, press the **FREEZE** key on the control panel to activate the CINE Review function. If the freeze response is set to CALIPER in the system presets, press the **FREEZE** key and then press the **CINE** key on the control panel to activate the CINE Review function.

  The system activates Frame Review.

### To display onscreen menu selections for CINE Review:

- When CINE is active, press the **MENU** key on the control panel.

  The system displays the CINE menu.

### To exit CINE Review:

- Press the **FREEZE** key to exit the CINE Review function and resume real-time imaging.

## Resetting CINE Memory

The following actions reset CINE memory; the CINE memory buffer empties and the system begins acquiring new data:

- Unfreezing an image
- Changing or re-selecting an imaging mode
- Changing or re-selecting the exam type or a QuickSet
- Changing the transducer or transducer frequency
- Powering off the system
- Pressing **F1** (New Patient)

CINE memory also resets in response to certain commands or functional changes performed during real-time imaging.

The following system settings or changes to the system ***will*** reset the memory:

| | | |
|---|---|---|
| Depth | Window (size or position) | Sweep Speed |
| Line Density | Dynamic Range | (M-mode) |
| | | Zoom |

The following system settings or changes to the system ***will not*** reset the memory:

| | | |
|---|---|---|
| L/R | Reject | Gain |
| Rotate (2D/M) | Cursor position (M-mode) | Transmit power |

# Frame Review

The Frame Review method provides access to any frame in the loop of data. You can edit the beginning and ending positions of the loop.

**To review CINE data using the Frame method:**

1. Activate CINE.
2. Select **Frame Review** from the CINE onscreen menu.

   The system displays the CINE indicator in the lower right of the image screen.
3. Roll the trackball to the left or right to review individual frames.

   The CINE indicator identifies the location of the current frame within the CINE data.

   **Note:** For M-mode, one frame of motion data is displayed at a time. No frame numbers are displayed.
4. To exit and clear the memory, press the **FREEZE** key.

   The system activates real-time imaging.

# Motion Review

The Motion Review method provides continuous display of CINE data in a forward direction. When Motion Review is active, the CINE menu displays the **Rate** selection for adjusting the review speed.

**To review CINE data using the Motion method:**

1. Activate CINE.
2. Display the CINE menu.
3. Roll the trackball to **Motion Review** and then press the **SET** key.

   The system begins a forward, continuous display of the CINE data at the frame rate at which it was acquired. This frame rate displays next to the **FPS** field on the upper left of the image screen.
4. To resume Frame Review, press the **MENU** key on the control panel and then select **Frame Review**.
5. To exit and clear the memory, press the **FREEZE** key.

   The system activates real-time imaging.

## Adjusting the Review Speed

During Motion Review, you can increase or decrease the review speed.

The maximum review speed is the frame rate (1/1). Other selections are: 1/2, 1/4, and 1/8 of the frame rate.

**To adjust the review speed:**

1. Display the CINE menu.
2. Roll the trackball to **Rate** and then press the **SET** key repeatedly to change the rate.

   The system updates the review speed of the CINE data.

# Editing the Loop

**[2] Instructions for Use**
Activating CINE A3-6

You can change the beginning and ending CINE review positions within a loop of data. This edit function allows you to exclude frames from review of a specific segment. Exiting the CINE function will reset both points.

*Markers indicate the edited segment of CINE data using* **Edit Start** *and* **Edit End** *menu selections.*

**To change the beginning position:**

1. Activate CINE.

   The system activates Frame Review.

2. Roll the trackball to advance the starting position of the CINE data, one frame at a time.

   The system repositions the marker on the CINE indicator representing the beginning position.

3. Display the CINE menu.

. Roll the trackball to **Edit Start** and then press the **SET** key to lock the marker for the edit beginning point.

5. To review the edited CINE data, display the CINE menu and select **Motion Review**.

**To change the ending position:**

**Note:** The end point for the CINE data cannot be moved ahead of the start point.

1. Activate CINE.

   The system activates Frame Review.

2 Roll the trackball to advance the ending position of the CINE data, one frame at a time.

   The system repositions the marker on the CINE indicator representing the ending position.

3. Display the CINE menu.

4. Roll the trackball to **Edit End** and then press the **SET** key to lock the marker for the edit ending point.

5. To review the edited CINE data, display the CINE menu and select **Motion Review**.

**To reset the beginning and ending positions:**

**1.** Display the CINE menu.

2. Roll the trackball to **Edit Reset** and then press the **SET** key.

   Edited beginning and ending positions are deleted.

# Dual CINE

**[2] Instructions for Use**

Dual-mode Ch A2

While operating in 2D Dual-mode, the system divides the CINE memory buffer into two equal parts to provide image recording. During 2D Dual-mode, you can acquire two independent single 2D-mode images. The loops display simultaneously side-by-side. Each loop is also available for individual replay.

## Reviewing and Synchronizing Dual-Mode Images

When set to **On**, the **Align** menu selection synchronizes the CINE display of the two 2D images during Dual-mode. The system displays the **Align** menu selection during Frame Review and Motion Review.

**To review CINE data in Dual-mode:**

1. After acquiring and freezing images in Dual-mode, activate CINE.

   The last active image in Dual-mode is the image under CINE review.

2. Press one of the **DUAL/SELECT** keys to select the active image under CINE review.
3. To synchronize the images:
   a. Display the CINE menu.
   b. Roll the trackball to **Align** and then press the **SET** key to display the **On** setting.
4. Press the **MENU** key to hide the CINE menu.

   The system activates Frame Review. The CINE indicator displays in the lower right of both Dual-mode images.

5. Roll the trackball to the left or right to review the two images simultaneously.

# CINE with M-Mode

During **Frame Review**, the sweep is played back, frame by frame. You can roll the trackball to scroll the sweep, one frame at a time, in either direction.

During **Motion Review**, the sweep is played back in a forward, continuous direction.

**To access full-screen CINE data with 2D/M-mode:**

1. Activate CINE.
2. Press the right **DUAL/SELECT** key to access a full-screen CINE M-mode sweep.
3. Press the left **DUAL/SELECT** key to access a full-screen CINE 2D-mode image.

   You can alternate pressing the right and left keys to toggle full-screen images.
4. Roll the trackball to perform a frame review or select **Motion Review** on the CINE menu for either full-screen image.
5. Press either **DUAL/SELECT** key a second time to return to the normal split-screen format.

# CINE Review Post-Processing

You can apply the following post-processing functions to CINE data in either Frame Review or Motion Review.

- 2D-mode menu selections for: **A-mode**, **Offset**, **Gray Map**, **Reject**
- Addition of Annotation and Pictograms
- Use of Measurement and Calculation packages, including the Report/Worksheet
- Changes in Image Orientation using the **L/R FLIP** key
- Magnification of the Image using the **DEPTH/ZOOM** control
- Storage of Images using the **PRINT/STORE** key and/or the **DIGITAL STORE** keys, and recording to an optionally connected VCR

**To access CINE Review after post-processing CINE data:**

- Press the **CINE** key.

**To exit CINE Review after post-processing CINE data:**

- Press the **FREEZE** key after post-processing CINE data.

  The system resumes its previous imaging mode and configuration of imaging parameters. CINE memory is cleared and begins filling with new data.

# A4 Biopsy

**Biopsy (Puncture) Guideline Function ..... 3**
Activating the Guideline Function ..... 4
Displaying the Biopsy Menu ..... 5
Changing a Setting on the Biopsy Menu ..... 5
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**Using the Guideline Function with the Endo-V II or Endo-P II Transducer ..... 8**
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Endo-P II Biopsy Menu Selections ..... 10

**Needle Path Verification ..... 12**
Adjusting the Guidelines ..... 13

# Biopsy (Puncture) Guideline Function

⚠ **WARNING:** Percutaneous procedures always involve heightened risk to the patient and to the operator handling biopsy needle guides. Clinicians using Siemens recommended biopsy devices under ultrasound guidance should be trained, and must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.

⚠ **WARNING:** The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy or puncture procedure.

You can display on-screen guidelines for use with transducers compatible with needle guide attachments.

For software versions 2.0 or higher: The Biopsy menu provides specific selections for the Endo-P II transducer.

The Biopsy function is available during real-time imaging in the following modes and mode formats:

- 2D-mode
- Dual-mode (guidelines are on the active image)
- Split-mode (guidelines are on the right image)
- Zoom (guidelines track to the zoomed image)
- Offset (guidelines track to the offset image)

**[2] Instructions for Use**

Biopsy Menu
Selections for the Endo-P II A4-10

# Activating the Guideline Function

**System Reference**

System Presets Ch 3

**F6**

Default Settings
▶Biopsy

The ultrasound system has several options for customizing the guidelines for use with a biopsy or puncture procedure.

Use the system presets to enable the Biopsy function to automatically activate when an exam type is selected.

**To initiate the Guideline function:**

1. Press the **F15** key on the keyboard. If you enabled an exam type to activate the Biopsy function when selected, select that exam type.

   The system displays this message as a precaution:

   *Caution: Verify needle path and scale prior to Biopsy. Select the **OK** button to continue.*

2. Select the **OK** button.
3. Before performing any patient procedure, verify the needle path.
4. To exit the function, press the **F15** key on the keyboard, or press the **2D** or **ESCAPE** key on the control panel.

## Displaying the Biopsy Menu

Options for customizing the biopsy guidelines are located on the Biopsy menu when the Biopsy function is active.

**To display the Biopsy or Transducer menu:**

1. Press the **MENU** key on the control panel.

   The system displays the default menu or the menu last viewed.

2. To change the displayed menu, roll the trackball to highlight the menu category at the top of the Measurement Menu. Example: **2D ▶**.

   The system displays the list of available menu categories.

3. Roll the trackball to highlight the name of a menu and then press the **SET** key.

   The system displays the selected menu.

## Changing a Setting on the Biopsy Menu

For software versions 2.0 or higher: The Biopsy menu provides specific selections for the Endo-P II transducer.

**To change a setting on the Biopsy menu:**

1. With the Biopsy function active, display the Biopsy menu.
2. Roll the trackball to highlight a selection in the Biopsy menu.
3. Press the **SET** key on the control panel or rotate the **SELECT** control on the control panel to select an option.

**[2] Instructions for Use**

Biopsy Menu
Selections for the Endo-P II A4-10

# Modifying the Display of Guidelines

The Biopsy menu provides several selections for controlling display of the Biopsy guidelines. You can adjust the angle at which the guidelines display. The **Display cm** and **Dot Interval** selections on the Biopsy menu offer options to include (or remove) centimeter markings along the guidelines and to select the interval for the dots representing the guidelines.

For software versions 2.0 or higher: The Biopsy menu provides specific selections for the Endo-P II transducer.

**[2] Instructions for Use**

Biopsy Menu
Selections for the
Endo-P II A4-10

**To display or hide Biopsy guidelines:**

- Press the **F15** key on the keyboard to toggle display of the guidelines.
- With the Biopsy function active, display the Biopsy menu.
  a. Roll the trackball to highlight **Guide** in the Biopsy menu.
  b. Press the **SET** key to toggle display of the guidelines **On** or **Off**.

**To adjust the guideline angle:**

1. With the Biopsy function active, display the Biopsy menu.
2. Roll the trackball to highlight **Angle Adjust** in the Biopsy menu and then rotate the **SELECT** control or press the **SET** key repeatedly to adjust the angle.
3. To reset the angle to zero, roll the trackball to highlight **Reset Angle** and then press the **SET** key.

**To display or remove centimeter depth markings along the guideline:**

1. With the Biopsy function active, display the Biopsy menu.
2. Roll the trackball to highlight **Display cm** in the Biopsy menu and then press the **SET** key to toggle the depth marking display options.

   **On** — displays centimeter depth numbers.

   **Off** — does not display centimeter depth numbers.

**To determine the interval for the dots representing the guidelines**:

1. With the Biopsy function active, display the Biopsy menu.
2. Roll the trackball to highlight **Dot Interval** in the Biopsy menu and then press the **SET** key to toggle the dot size options.

   **10 mm** – The system displays dots representing guidelines at 10 mm intervals.

   **5 mm** – The system displays dots representing guidelines at 5 mm intervals.

# Using the Guideline Function with the Endo-V II or Endo-P II Transducer

When using the Endo-V II or Endo-P II mechanical sector transducers, you must correctly orient the active imaging sector of the transducer before the ultrasound system can display the needle guidelines.

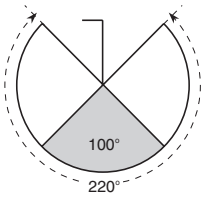
**[2] Instructions for Use**

Activating the Guideline Function A4-4
Endo-V II Ch C2
Endo-P II Ch C3

## Endo-V II Transducer

You can only activate the biopsy function for the Endo-V II transducer when the active imaging sector is positioned in the *end-fire* direction of the transducer. If you adjust the imaging sector away from the end-fire direction and then activate the biopsy function, the system automatically repositions the transducer's crystal into the end-fire direction.

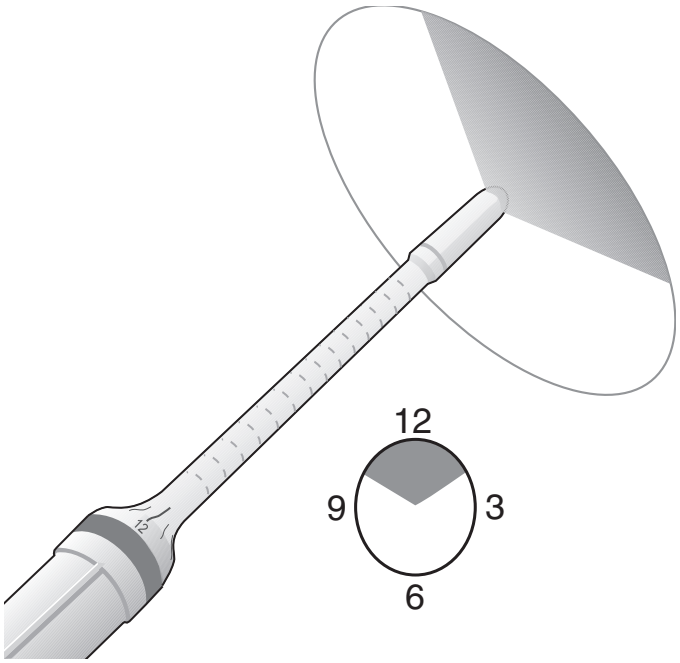
You can independently adjust the scan angle during a biopsy procedure.




*Example of the on-screen symbol representing a 220° scan angle for the Endo-V II transducer. The active imaging sector is represented by the shaded sector, depicting the end-fire direction of the transducer.*

# Endo-P II Transducer

When you use a needle guide with the Endo-P II transducer, always begin imaging in the transverse plane. Since the needle guide is in a fixed position on the transducer, you cannot reposition the active imaging sector using the trackball. The active image sector during a biopsy or puncture procedure is at the 12 o'clock position of the transducer.




*Example of the Endo-P II transducer's transverse scan plane and the on-screen symbol for the transverse plane.*

# Endo-P II Biopsy Menu Selections

(Requires software version 2.0 or higher)

**[2] Instructions for Use**

Changing a Menu Setting A4-5

You must select the biopsy/puncture guidelines that correspond to the needle bracket attached to the Endo-P II transducer using the **Type** selection in the Biopsy menu. The option selected for **Type** determines the available menu selections.

**Note:** The Endo-P II transducer must be in the transverse scan plane to access the **Type** option. To change scan planes, ensure that none of the Biopsy menu selections are highlighted and then press the **SET** key.

## Biopsy/Puncture Guidelines for the Endo-P II Transducer and Endorectal Linear (RL) and Curved (RC) Needle Brackets

| Selection | Description | Options |
|---|---|---|
| **Guide** | Toggles the display of the biopsy/puncture guidelines **On** or **Off**. | **On**<br>**Off** |
| **Type** | Selects biopsy/puncture guidelines corresponding to the needle bracket attached to the Endo-P II transducer. | **RL** (Rectal Linear)<br>**RC** (Rectal Curved) |
| **Display cm** | Displays centimeter markings (numbers) indicating depth along the guidelines. | On, Off |
| **Dot Interval** | Selects dot sizes to represent the biopsy/puncture guidelines. | **10 mm**– The system displays dots representing guidelines at 10 mm intervals.<br>**5 mm** – The system displays dots representing guidelines at 5 mm intervals. |
| **Angle Adjust** | Finely adjusts the angle of the biopsy/puncture guidelines. | **0-80** – The range of adjustment is +/- 8 degrees in 0.1° increments. |
| **Reset Angle** | Restores the original position of the biopsy/puncture guidelines. | **0** |

## Puncture Guidelines for the Endo-P II Transducer and Brachytherapy (Tpl)

(Requires the Brachytherapy Template Software option and a mechanical sector transducer port on the ultrasound system)

The Endo-P II transducer must be in the transverse scan plane to access the Biopsy menu selections for the **Tpl** guidelines.

| Selection | Description | Options |
|---|---|---|
| **Guide** | Toggles the display of the biopsy/puncture guidelines **On** or **Off**. | **On**<br>**Off** |
| **Type** | Selects biopsy/puncture guidelines corresponding to the needle bracket attached to the Endo-P II transducer. | **RL** – Rectal Linear<br>**RC** – Rectal Curved<br>**Tpl** – Template |
| **Display Mark** | Displays markings to identify the rows and columns of the **Tpl** guidelines. | **On1**<br>**On2**<br>**Off** |
| **Dot Interval** | Selects dot sizes to represent the **Tpl** guidelines. | **10 mm**– The system displays dots representing guidelines at 10 mm intervals.<br>**5 mm** – The system displays dots representing guidelines at 5 mm intervals. |
| **Adjust X** | Finely adjusts the "X" axis of the **Tpl** guidelines. | **0-99** – The range of adjustment is +/- 9.9 mm in 0.1 mm increments. |
| **Adjust Y** | Finely adjusts the "Y" axis of the **Tpl** guidelines. | **0-99** – The range of adjustment is +/- 9.9 mm in 0.1 mm increments. |
| **Reset Adjust X** | Restores the original position of the "X" axis for the **Tpl** guidelines. | **0** |
| **Reset Adjust Y** | Restores the original position of the "Y" axis for the **Tpl** guidelines. | **0** |

# Needle Path Verification

Before performing any patient procedure using a needle guide, you must verify that the path of the needle is accurately indicated by the onscreen guidelines.

The needle guide is ready for patient use ***only after the path of the needle has been verified***.

**Checklist of Items Required for Needle Path Verification**

- ❒ Transducer with attached needle guide
- ❒ Water-based coupling agent (gel)
- ❒ Sterile transducer cover
- ❒ New, straight, biopsy needle
- ❒ Sterilized container of sterilized and degassed water

**To verify the path of the needle:**

⚠ **WARNING:** The biopsy guidelines that display on the system monitor are not intended as an absolute reference. It is the user's responsibility to verify correct positioning of the needle during a biopsy or puncture procedure.

⚠ **WARNING:** Do not use a needle guide if the path of the needle is not accurately indicated by the onscreen guidelines. The path of the needle must display within the guideline. Contact your Siemens service representative if the needle path is not accurately indicated.

1. Attach the needle guide to the transducer.
2. Connect the transducer to the system and activate the transducer.
3. Set the system to the depth of the intended puncture procedure.
4. Press the **F15** key on the keyboard to display the guidelines onscreen.
5. Immerse the head of the transducer into the degassed water and insert the needle into the needle guide.
6. Verify that the path of the needle displays according to the guidelines shown on the image screen.
7. After verification, the needle guide is ready for use.

**[2] Instructions for Use**

Needle path adjustment A4-13

# Adjusting the Guidelines

You can finely adjust the position of guidelines using the **Angle Adjust** Biopsy menu selection.

For software versions 2.0 or higher: The Biopsy menu provides specific selections for the Endo-P II transducer.

**[2] Instructions for Use**

Biopsy Menu
Selections for the
Endo-P II A4-10

### To adjust the guidelines:

⚠ **WARNING:** Do not use a needle guide if the path of the needle is not accurately indicated by the onscreen guidelines. Contact your Siemens service representative if the needle path is not accurately indicated.

1. Display the Biopsy menu.
2. Roll the trackball to highlight **Angle Adjust** in the Biopsy menu and then press the **SET** key to incrementally change the position of the guidelines. The range of adjustment is +/- 8 degrees in 0.1° increments.

   The path of the needle must display within the guidelines.

### To reset the guidelines to the factory-default position:

1. Display the Biopsy menu.
2. Roll the trackball to highlight **Reset Angle** in the Biopsy menu and then press the **SET** key to restore the original position of the guidelines.

# B1 Measurements and Calculations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# Measurement Function ▪ Overview

The measurement function contains the measurements and calculations available for each exam type and imaging mode. You can use the measurement function during a patient examination, on images stored in CINE Review.

## General and Exam-Specific Measurements

The ultrasound system contains measurements and calculations that are either ***General*** – standard for all exam types – or ***Exam-specific*** – particular to one exam type.

Calculations use formulas that require specific measurements. The system automatically performs a calculation when the required measurements have been completed.

## Measurement Setup

Use the system presets to customize the Measurement function.

- Specify the shape, size, and default position for the caliper.
- Activate or deactivate a background for the Measured Results section of the image screen.
- Determine whether the system initially displays general measurement methods or exam-specific measurement labels.

**[2] Instructions for Use**


General Measurements:
- 2D-mode B1-20
- M-mode B1-36

Exam-Specific Measurements:
- Cardiac Ch B5
- Cranial B1-51
- Endorectal Ch B4
- Gynecology B1-42
- Obstetrical Ch B2
- Orthopedics B1-47
- Urology Ch B4
- Rectal Ch B4
- Emergency Medicine Ch B3

CINE Ch A3


**System Reference**


System Presets Ch 3
Recording Devices Ch 4

# Activating the Measurement Function

Activate the measurement function by pressing the **CALIPER** key. When you press the **CALIPER** key, a Measurement Menu displays measurement selections appropriate for the imaging mode and exam type. The system also places the first marker in a ***caliper*** set (set of measurement markers) on the image. To access a Measurement Menu directly, press the **CALIPER** key a second time.

***Caliper***

Use the system presets to automatically activate the measurement function each time you press the **FREEZE** key. If this default has not been set, press the **CALIPER** key to enter the measurement function while an image is frozen for M-mode. You can perform measurements on a real-time or frozen 2D-mode image.

Use the system presets to assign the position of the trackball pointer (caliper) when you activate the measurement function. The system will do one of the following:

- Place the first measurement marker in the center of the image screen.
- Highlight the Measurement Menu.
- Display the first measurement marker with a dotted line, representing the depth from the skin line and indicating the Depth in the Measured Results.

The active exam type and Measurement Menu display on the left side of the image screen. The Measured Results display on the bottom of the image screen.

**System Reference**

System Presets Ch 3

**F6**

Default Settings
▶ Automatic **FREEZE** Response
M&R
▶ Caliper Default Position

# Measurement Calipers

After you press the **CALIPER** key to activate the measurement function, the trackball is active in either the image screen or the Measurement Menu. Select the trackball active location in the system presets. If the trackball is active on the image, the system places the first measurement marker of a ***caliper set*** on the image screen. If the trackball is active in the Measurement Menu, you can press the **CALIPER** key again to switch trackball control to the image screen and display the first measurement marker.

Each caliper set includes one or more pairs of measurement markers for indicating the beginning and ending points of a measurement. Some caliper sets require multiple measurements to calculate one value; all related markers are identified with the same caliper set number. The system can display a maximum of eight caliper sets at one time. If you attempt to add more caliper sets, the system prompts you to press the **ESCAPE** key and then press the **CALIPER** key to enable eight more caliper sets. All labeled measurements are retained.

## Maximum On-Screen Calipers

Depending on the measurement, up to eight caliper sets can display on an image at one time. Use the system presets to select the shape and size of a caliper measurement marker.

| Caliper Type | Description | Mode |
|---|---|---|
| + +<br>x x | Indicate beginning and ending points for each pair of markers. | **2D-mode:** Depth, Distance, Area, Circumference, and Volume<br>**M-mode**: Distance, Slope, Velocity |
| \| \| | Delineates beginning and ending positions for marking horizontal position or an interval. | **M-mode:** Time, Heart Rate |

**System Reference**

System Presets Ch 3

**F6**

M&R
- ▶ Caliper Default Position
- ▶ Shape Pattern
- ▶ Shape Size

## Caliper Sets and Measurement Data

A number displays next to the first marker of each marker pair. This number identifies the caliper set and the corresponding measurement data that displays in the Measured Results. The number may be repeated if multiple measurements are required in the same image.

**[2] Instructions for Use**

Measured Results B1-12

## Positioning and Anchoring Calipers

Position a measurement marker by rolling the trackball. An active marker is bold. Anchor a marker by pressing the **SET** key. An anchored marker is non-bold. A second measurement marker in a caliper set displays near the first marker. Position the second marker by rolling the trackball; the system automatically updates the value of the measurement in the Measured Results. Anchor the second marker by pressing the **SET** key.

# Measurement Menu

Activating the measurement function causes the system to display a Measurement Menu on the left side of the image screen. The Measurement Menu indicates the selected measurement method and contains system and any user-defined labels for the active exam type and imaging mode.

Use the system presets to determine whether the system initially displays general measurement methods or exam-specific measurement labels.

## Multi-Page Menus

If the menu has additional pages (e.g., during OB measurements), access the pages by rolling the trackball to the page number at the bottom of the menu and then pressing the **SET** key.

## Measurement Methods and Measurement Labels

All available menu categories are located and selectable at the top of the Measurement Menu. Each menu category is associated with its own list of measurement methods, measurement labels, or actions available during the Measurement function.

| | |
|---|---|
| **General (2D)** ▶ | General (2D) |
| Distance | OB (2D) |
| Trace | Other |
| Ellipse | |
| Volume | |

*Example of Measurement Menu with a list of measurement methods assigned to the **General (2D)** menu category (on the left) and the available menu categories (on the right).*

**To display the list of general measurement methods:**

1. Activate the measurement function.
2. Roll the trackball to highlight the menu category at the top of the Measurement Menu. For example: **OB (2D)** ▶.
3. Press the **SET** key.

   The system displays the list of menu categories, such as **General (2D)**, **OB (2D)** and **Other**.
4. Roll the trackball to select the general category and then press the **SET** key.

   The system displays the measurement methods specified in the system presets for the current exam type.

**F6**

M&R
▶Measurement and Report Preset
▶▶Measurement Method
▶▶Customize General Measurement Menu
▶Default Menu Category

**To display the list of exam-specific measurement labels:**

1. Activate the measurement function.
2. Roll the trackball to highlight the menu category at the top of the Measurement Menu. For example**: General (2D)** ▶.
3. Press the **SET** key.

   The system displays the list of menu categories, such as **General (2D)**, **OB (2D)**, and **Other**.
4. Roll the trackball to select the exam-specific category and then press the **SET** key.

   The system displays the measurement labels for the current exam type.

## Measure then Label, Label then Measure

To include a measured value in a patient report, you must assign a label to the value. You can either perform a measurement and then assign the measured value to a label **–** *Measure then Label* **–** or select a label and then use the default measurement method for the selected label to perform the measurement **–** *Label then Measure*.

Some measurements require the use of specific measurement methods. When you highlight a label in the Measurement Menu, the system automatically displays the required measurement method at the top of the menu.

When a label has been assigned a measured result, the system displays the value next to the label in the Measured Results section of the screen. To view the labeled values in an exam with a patient report, press the **F2** key on the keyboard at any time during the exam or select **Report** from the Measurement Menu during the measurement function.

The following exams contain specific labels that are assignable to a value for display in a report: OB, Early OB, GYN, Ortho, Cardiac, and Urology.

### To measure then label:

**Note:** This procedure uses the term "select" as defined in the conventions for this manual. To select an on-screen object such as a label, method, or a ▶ symbol, roll the trackball to position the pointer (cursor) on the object and then press the **SET** key on the control panel.

1. During an exam, acquire and freeze the image or sweep.
2. Activate the measurement function.

   The system displays a list of measurement labels or a list of measurement methods available for the exam type in the Measurement Menu.

3. If a list of measurement methods does not display, then select the menu category at the top of the Measurement Menu, and select the name of the list of measurement methods from the available categories (on the right) for the Measurement Menu.
4. Select a method from the list of measurement methods.

   The system places a measurement marker on the image. The system displays measurement data in the Measured Results, such as (**D**) for distance, (**C**) for circumference, and (**A**) for area. The system also displays the corresponding measurement units, such as **mm** for distance and circumference, and **cm$^2$** for area.

5. Roll the trackball to position the measurement marker and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.

6. Roll the trackball to position the next measurement marker and then press the **SET** key.

   The system automatically updates the measurement data in the Measured Results.

7. To assign the measurement data to a label, select the measurement label from the Measurement Menu.

   The system displays the measurement label and corresponding value in the Measured Results, and assigns the value to the label in the worksheet and the patient report.

8. If the selected label requires additional measurement data, the system activates a new measurement marker on the image. Continue making measurements until all items called for in the Measured Results have been completed. The system then assigns the Measured Results to the measurement label in the Measurement Menu.

   **Note:** Raw and labeled measurement data displays while a measurement is in progress. Raw (unlabeled) measurement data will not be retained when you exit the measurement function. Labeled measurement data reappears when the measurement function is reentered.

### To label then measure:

**Note:** Use the system presets to assign the trackball to the Measurement Menu when you activate the measurement function.

1. During an exam, acquire and freeze the image or sweep.
2. Activate the measurement function.

   The system displays a list of measurement labels or a list of measurement methods available for the exam type in the Measurement Menu.
3. If a list of measurement labels does not display, then select the menu category at the top of the Measurement Menu, and select the name of the list of measurement labels from the available categories (on the right) for the Measurement Menu.
4. Select a label from the list of measurement labels.

   The system displays the measurement method required for the selected label at the top of the Measurement Menu, activates that measurement method, and places a measurement marker on the image. The system also displays measurement data in the Measured Results.
5. Roll the trackball to position the measurement marker and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.
6. Roll the trackball to position the next measurement marker and then press the **SET** key to complete the measurement. Measurement data updates in the Measured Results as each measurement is made.
7. To continue measurements, repeat steps 4 through 6 as required.

   When all required measurements are complete, the system displays the measurement label and corresponding value in the Measured Results and assigns the value to the label in the worksheet and the patient report.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Caliper Default Position

# Reassigning a Measured Value to a Label (Undo Feature)

You can "undo" the most-recent label assignment. If you have begun another measurement or changed modes, you cannot undo a label assignment.

For software versions 2.0 and higher: You can undo a label assignment using a shortcut (key combination).

**To undo a label assignment using a shortcut:**

(Requires software version 2.0 or higher)

1. After completing a measurement, use the shortcut **Ctrl+U**: Press and hold the **Ctrl** key on the keyboard and then press the **U** key on the keyboard.

   The system removes the label assignment from the measured value and displays the Measurement Menu. The value is still in memory.

2. To assign the value to a different label, select the new label.

   The system updates the Measured Results with the new label assignment.

**To undo a label assignment:**

1. After completing a measurement, select the menu category at the top of the Measurement Menu. For example**: OB (2D) ▶**.
2. Select the category **Other**.

   The system displays the list of available actions in the Measurement Menu.

3. Select **Undo**.

   The system removes the label assignment from the measured value and displays the Measurement Menu. The value is still in memory.

4. To assign the value to a different label, select the new label.

   The system updates the Measured Results with the new label assignment.

# Default Measurement Methods by Imaging Mode

Use the system presets to select the default measurement method for each exam type.

| Imaging Mode | Default measurement |
|---|---|
| 2D-mode | Distance (2D-mode measurement) |
| 2D/M-mode | Distance (M-mode measurement) |

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurement and Report Preset

# Measured Results

Values from measurements and calculations display in the Measured Results section of the image screen. Measured Results display as raw measurement data until all steps required by the selected measurement method have been completed. If available in the Measurement Menu, a label can then be assigned; the completed Measured Results are labeled accordingly. If a label is not available or if a measurement method is used that is not compatible with any label, the completed Measured Results are not labeled and retain the display format used when they were still raw measurement data.

All raw measurement data and unlabeled Measured Results are deleted when the measurement function is deactivated. Completed, labeled Measured Results are retained; you can access them again by pressing the **CALIPER** key to reactivate the measurement function.

## Activating a Background for Measured Results

Use the system presets to activate or deactivate a background for the Measured Results section of the image screen.

## Repositioning or Hiding Measured Results

When the measurement function is active, you can use selections in the menu category **OTHER** to reposition the placement of Measured Results on the screen or to hide the Measured Results.

**To reposition or hide the Measured Results:**

1. Select the menu category at the top of the Measurement Menu. For example: **General (2D)** ▶.

   The system displays the list of menu categories.

2. Select the category **Other**.

   The system displays the list of available actions in the Measurement Menu.

3. To reposition the Measured Results, roll the trackball to highlight **Meas Pos** and then press the **SET** key until the Measured Results display in the new position.

4. To hide the Measured Results, roll the trackball to highlight **Meas** and then press the **SET** key to change the setting to **Off**.

## Repositioning Anchored Markers for Measurements with Measured Results

You can reposition the placement of the measurement markers on the image screen and subsequently modify the values in the Measured Results during the current session of the measurement function. If you cancel and then reactivate the measurement function, previously completed Measured Results display again, but cannot be modified.

**Note:** You can subsequently modify the values of Measured Results in a Worksheet (for exams with a worksheet).

For software versions 2.0 and higher: You can modify the Measured Results using a shortcut (key combination).

### To modify the Measured Results using a shortcut:

(Requires software version 2.0 or higher)

1. Use the shortcut **Ctrl+M**: Press and hold the **Ctrl** key on the keyboard and then press the **M** key on the keyboard.

   If multiple measurements are on the screen, then the system indicates the selected measurement by dimming the value in the Measured Results.

2. To select another measurement, rotate the **SELECT** key on the control panel.
3. Press the **SET** key on the control panel to activate the selected measurement.

   **Note:** To cancel modification, press the **MENU** key on the control panel.

   The system places trackball control on the image screen and activates the first measurement marker of the completed measurement.

4. Roll the trackball to reposition the measurement marker and then press the **SET** key on the control panel.

   The system activates the next measurement marker of the completed measurement.

5. Continue adjusting measurement markers as needed.

   When all of the measurement is completed, the system redisplays the previous menu category for the Measurement Menu.

**To modify the Measured Results:**

1. Select the menu category at the top of the Measurement Menu.
   For example: **General (2D)** ▶.

   The system displays the list of menu categories.

2. Select the category **Other**.

   The system displays the list of available actions in the Measurement Menu.

3. Select **Modify**.

   If multiple measurements are on the screen, then the system indicates the selected measurement by dimming the value in the Measured Results.

4. To select another measurement, rotate the **SELECT** key on the control panel.
5. Press the **SET** key on the control panel to activate the selected measurement.

   **Note:** To cancel modification, press the **MENU** key on the control panel.

   The system places trackball control on the image screen and activates the first measurement marker of the completed measurement.

6. Roll the trackball to reposition the measurement marker and then press the **SET** key.

   The system activates the next measurement marker of the completed measurement.

7. Continue adjusting measurement markers as needed.

   When all of the measurement is completed, the system redisplays the previous menu category for the Measurement Menu.

## Deleting Measurements

You can remove measurements from the screen. The values of the removed measurements remain in the Measured Results and in the patient report.

**To remove the last measurement from the screen, choose a method:**

1. For software versions 2.0 and higher: Use the shortcut method:
   a. Use the shortcut **Ctrl+D**: Press and hold the **Ctrl** key on the keyboard and then press the **D** key on the keyboard.

      If multiple measurements are on the screen, then the system indicates the selected measurement by dimming the value in the Measured Results.

   b. To select another measurement, rotate the **SELECT** key on the control panel.

   c. Press the **SET** key on the control panel to activate the selected measurement.

   **Note:** To cancel deletion, press the **MENU** key on the control panel.

2. Use the Measurement Menu:
   a. Select the menu category at the top of the Measurement Menu. For example: **General (2D)** ▶.

      The system displays the list of menu categories.

   b. Select the category **Other**.

      The system displays the list of available actions in the Measurement Menu.

   c. Select **Delete**.

      If multiple measurements are on the screen, then the system indicates the selected measurement by dimming the value in the Measured Results.

   d. To select another measurement, rotate the **SELECT** key on the control panel.

   e. Press the **SET** key on the control panel to activate the selected measurement.

   **Note:** To cancel deletion, press the **MENU** key on the control panel.

**To remove all measurements from the screen:**

1. Select the menu category at the top of the Measurement Menu. For example: **General (2D)** ▶.

   The system displays the list of menu categories.

2. Select the category **Other**.

   The system displays the list of available actions in the Measurement Menu.

3. Select **Delete All**.

# General Measurements ▪ Abbreviations of Measured Results

| 2D-mode Measurement | Unit | Abbreviation |
|---|---|---|
| Distance, diameter, trace, circumference | millimeters | mm |
| Area | centimeters$^2$ | cm$^2$ |
| Angle | degrees | ° |
| Volume, one or two-plane | cubic centimeters | cm$^3$ |
| Volume, residual urine | milliliter | mL |
| %Stenosis | percent | % |

| M-mode Measurement | Unit | Abbreviation |
|---|---|---|
| Distance | millimeters | mm |
| Heart rate | beats per minute | bpm |
| Time | milliseconds | ms |
| Slope | millimeters per second | mm/s |
| Velocity | meters per second | m/s |

# Exiting the Measurement Function

Raw measurement data, completed Measured Results, and the Measurement Menu are erased from the image screen when you exit the measurement function by unfreezing the image or by pressing the **ESCAPE** key on the control panel. The system discards raw measurement data but retains all Measurement Label assignments and completed Measured Results for the exam. The system discards Measurement Label assignments and completed Measured Results if a new patient is selected or if the power is cycled.

# General Measurements

The system can calculate a ratio of measured values in all exam types and imaging modes.

## Calculating a Ratio of Measured Results

Use the **Ratio** measurement method to determine ratios for the following measurements:

| Mode | Measurement Label | Ratio |
|---|---|---|
| 2D-mode | A/B Ratio | A/B |
| | Dist Ratio | B/A |
| | Vol Ratio | (A - B)/A |
| | Area Ratio | |
| M-mode | A/B Ratio | A/B |
| | Dist Ratio | B/A |
| | Time Ratio | (A - B)/A |

Use the system presets to customize the ratio methods that are available for each exam type and imaging mode.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset

**To determine a ratio:**

1. Activate the measurement function. (If necessary, display the General menu category for the Imaging mode. Example: **GENERAL(2D) ▶**.)
2. If you are using a measurement other than the default, select the measurement method.
3. Complete the first measurement.
4. Perform the second measurement. You must use the same method selected for the first measurement.

   When you complete the second measurement, the measurement ratio is also completed. If a ratio label is available, you can now assign the label to the measured value. The Measured Results display the measurements for A, B, A/B, B/A, and (A-B)/A, and any labeled measured values.

# General 2D-Mode Measurements and Calculations

General 2D-mode measurements include depth, distance, and circumference and calculations for area, volume, and ratios. The system displays measurement data for General Measurements. If you use a General Measurement method required by a label, you can assign the measurement to that label.

## General Caliper Performance in 2D-Mode

| To: | Perform this action: |
|---|---|
| Anchor a marker | Press the **SET** key on the control panel. |
| Complete a measurement | Press the **SET** key on the control panel. |
| Make another measurement | Press the **CALIPER** key on the control panel after the measurement is complete. |
| Exit the measurement function | Press the **ESCAPE** key or the **FREEZE** key on the control panel to unfreeze the image. |

## Measuring Depth

If selected as an option in the system presets, depth is automatically measured when the first measurement marker displays on the image. The distance from a point on the transducer–skin interface to the marker is displayed in the Measured Results until the first marker is anchored.

## Measuring Straight-Line Distance

Distance is the default measurement method for 2D-mode and displays as the measurement method when the **CALIPER** key is pressed. The distance measurement calculates the length of a straight line between two markers.

**System Reference**

System Presets Ch 3

**To make a distance measurement:**

1. Activate the measurement function.
2. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.

   The system anchors the first marker and displays a second marker.
3. Roll the trackball to position the second measurement marker.

   The system automatically updates the distance (**D**) in the Measured Results.
4. To complete the measurement, press the **SET** key.

   The measured distance (**D**) displays in the Measured Results.

**F6**

M&R
▶ Caliper Default Position

## Measuring Trace Distance

Measure distance for non-straight lines by using the **Trace Length** 2D-mode measurement method.

**To make a trace distance measurement:**

1. Activate the measurement function.
2. Select **Trace Length** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.
4. Roll the trackball to trace a distance with a second measurement marker.

   The system automatically updates the distance (**D**) in the Measured Results.
5. To untrace, rotate the **SELECT** control on the control panel counterclockwise.
6. To complete the measurement, press the **SET** key.

   The measured distance (**D**) displays in the Measured Results.

# Making the Ellipse Measurement

The Ellipse measurement method is used to determine the circumference and area by positioning a graphical ellipse over the structure of interest.

### Ellipse Circumference Measurement Accuracy

The formula used for computing the circumference is most accurate when the two diameters used in the measurement, $D_1$ and $D_2$, are close to being equal.

**Note:** Common formulas for the calculation of the Ellipse circumference are approximations. The formula used by the system will provide an accurate result (< 2% error) as long as one diameter does not become more than twice the other.

If a circumference measurement is required for image areas where the ratio of the diameters is more than 2-to-1, the Trace method is recommended to ensure adequate measurement accuracy.

### To make an ellipse measurement:

1. Activate the measurement function.
2. Select **Ellipse** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.

   The system anchors the marker, displays an ellipse, and displays two diameters (**D1**, **D2**), the circumference (**C**), and the area (**A**) in the Measured Results.
4. Roll the trackball to rotate the first axis and adjust the size of the ellipse and then press the **SET** key.

   The system updates the measurement data in the Measured Results.
5. Roll the trackball to adjust the shape of the ellipse along the second axis and then press the **SET** key.

   The system updates the measurement data in the Measured Results.
6. Roll the trackball to position the ellipse on the image and then press the **SET** key to anchor the ellipse.

## Making a Trace Circumference Measurement

The Trace method is used to manually determine the circumference of a structure. The system calculates the area inside the trace.

**To perform a trace measurement:**

1. Activate the measurement function.
2. Select **Trace** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to create a trace of the structure.

   **Note:** You can rotate the **SELECT** control on the control panel to delete the trace before completing the circumference.
5. To complete the trace, press the **SET** key.

   The system displays the circumference (**C**) and area (**A**) of the traced structure in the Measured Results.

## Measuring an Angle

The Angle measurement requires the placement of two lines to determine an angle. The lines must intersect or connect. The system calculates and displays both angles formed by the two lines. The Angle measurement is not available with all exam types.

**To measure an angle:**

1. Activate the measurement function.
2. Select **Angle** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker at the beginning of the reference line and then press the **SET** key on the control panel.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to position the second measurement marker at the end of the reference line and then press the **SET** key.

   The system anchors the reference line and displays a third measurement marker.
5. Roll the trackball to position the third measurement marker at the beginning of the angle line and then press the **SET** key.

   The system anchors the marker and displays a fourth marker.
6. Roll the trackball to position the fourth measurement marker at the end of the angle line and then press the **SET** key.

   The system anchors the angle line, labels the $\alpha$ angle and the $\beta$ angle, and displays the angle values in the Measured Results.

# Making a Two-Plane Volume Calculation

The two-plane volume calculation requires measurements to be performed in two separate planes, using two 2D images. The system requires measurements in two planes for the following volume calculations:

- **2Pl LxDxW**
- **2Pl Ellipse**
- **2Pl Trace**
- **Thyroid**

**Note:** Except for the thyroid volume, the procedures for each volume calculation describe the steps for making measurements in Dual-mode. To use full-screen 2D-mode images, follow the instructions in the note at the beginning of each procedure.

## LxDxW Method

LxDxW is the default method for two-plane volume calculations. To use this method, obtain three distance measurements: length and depth in one plane, and width in another plane. The system uses the following formula to calculate the volume:

$$\text{Volume} = \frac{(\pi \times L \times D \times W)}{6}.$$

The system assumes you will perform the measurements in the sequence length, depth, and width. If you are using two single 2D-mode images, you must perform two measurements in the first plane.

### To obtain a two-plane volume using the LxDxW method:

**Note:** The procedure below assumes you have acquired images in Dual-mode. If single 2D-mode images are used, perform the first six steps below on one image. Unfreeze the system. If you press the **ESCAPE** key on the control panel, the system erases the measurements. Acquire and freeze the second image. Press the **CALIPER** key on the control panel, and then perform steps 7 and 8. The system displays the saved values from the first image and combines them with the measured values from the second image to produce the volume measurement.

1. Activate the measurement function.
2. Select **2Pl LxDxW** from the 2D-mode measurement methods.

   The system displays three distances (**D1**, **D2**, **D3**) and a volume (**V**) in the Measured Results.

3. Roll the trackball to position the first measurement marker for the length and then press the **SET** key on the control panel.

   The system displays a second marker and updates the distance value (**D1**).

4. Roll the trackball to position the second measurement marker and then press the **SET** key.

   The system anchors the marker and displays the length (**D1**) in the Measured Results. The system also displays the first marker in the second set of measurement markers on the image screen.

5. Roll the trackball to position the first measurement marker for the depth measurement and then press the **SET** key.

   The system anchors the marker, updates the distance (**D2**), and displays a second marker.

6. Roll the trackball to position the second measurement marker for the depth measurement and then press the **SET** key.
7. On the second image, roll the trackball to position the first measurement marker for the width measurement and then press the **SET** key.

   The system anchors the marker, displays a second marker and updates the distance (**D3**) and volume (**V**).

8. Roll the trackball to position the second measurement marker and then press the **SET** key.

   The system displays the length (**D1**), depth (**D2**), width (**D3**), and calculated volume (**V**) in the Measured Results.

## Ellipse Method

To measure a volume using the Ellipse method, you must take measurements in two separate planes, using two 2D-mode images. The system uses the following formula to calculate the volume:

$$\text{Volume} = \frac{\pi}{6} \times L1 \times \frac{4A1}{\pi L1} \times \frac{4A2}{\pi L2},$$

where L1 and L2 are the longest dimensions in each plane.

### To obtain a two-plane volume using the ellipse method:

**Note:** The procedure below assumes you have acquired images in Dual-mode. If single 2D-mode images are used, perform the first six steps below on one image. Unfreeze the system. If you press the **ESCAPE** key on the control panel, the system erases the measurements. Acquire and freeze the second image. Press the **CALIPER** key on the control panel, and then perform steps 7 and 8. The system displays the saved values from the first image and combines them with the measured values from the second image to produce the volume measurement.

1. Activate the measurement function.
2. Select **2Pl Ellipse** from the 2D-mode measurement methods.

   The system displays distances (**D1**, **D2**) and area (**A**) for two ellipses and the total volume (**V**) in the Measured Results.
3. Roll the trackball to position the first measurement marker on the axis that is common to both planes and then press the **SET** key on the control panel.

   The system anchors the marker and displays an ellipse. The dotted line represents the axis common to both planes.
4. Roll the trackball to adjust the axis that is common to both planes and then press the **SET** key.

   The system automatically updates the diameter (**D**) and area (**A**) values in the Measured Results.
5. To adjust the shape of the ellipse along the second axis, roll the trackball and then press the **SET** key.

   The system updates the diameter (**D1**, **D2**) and area (**A**) measurements for the ellipse in the Measured Results.
6. Roll the trackball to position the ellipse on the image and then press the **SET** key.
7. On the second image, roll the trackball to position the first measurement marker and then press the **SET** key.

   The system anchors the marker and displays a second marker.
8. Repeat steps 4 through 6 for the second image.

   The system displays the diameters (**D1**, **D2**) and area (**A**) measurements for the second ellipse above the calculated volume (**V**) in the Measured Results.

## Trace Method

To measure a two-plane volume using the Trace method, you must use the trackball to outline two structures in two separate planes and identify the axis common to both planes in each structure. The system uses the following formula to calculate the volume:

$$\text{Volume} = \frac{\pi}{6} \times L1 \times \frac{4A1}{\pi L1} \times \frac{4A2}{\pi L2}$$

### To obtain a two-plane volume using the trace measurement:

**Note:** The procedure below assumes you are imaging in Dual mode. If single 2D-mode images are used, perform the first seven steps below on one image. Unfreeze the system. If you press the **ESCAPE** key on the control panel, the system erases the measurements. Acquire and freeze the second image. Press the **CALIPER** key on the control panel then perform steps 8 and 9. The system displays the saved values from the first image, and combines them with the measured values from the second image to produce the volume measurement.

1. Activate the measurement function.
2. Select **2Pl Trace** from the 2D-mode measurement methods.

   The system displays an area (**A**) and distance (**D**) for two traces and the volume (**V**) in the Measured Results.
3. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to create a trace of the structure.

   **Note:** You can use the **SELECT** control to delete the trace before completing the circumference. Rotate the **SELECT** control counterclockwise to delete the trace or clockwise to redraw deleted portions of the trace.
5. To complete the trace, press the **SET** key.

   The system displays the area (**A**) of the traced structure in the Measured Results. The system also displays the first measurement marker for identifying the axis common to both planes.

6. Roll the trackball to position the first measurement marker at the beginning of the axis common to both planes and then press the **SET** key.

   The system anchors the marker and displays a second marker.

7. Roll the trackball to position the second measurement marker to indicate the end of the axis and then press the **SET** key.

   The system anchors the second marker and displays the length (**D1**) and area (**A1**) in the Measured Results.

8. On the second image, roll the trackball to position the first measurement marker and then press the **SET** key.

   The system anchors the marker and displays a second marker.

9. Repeat steps 4 through 7 for the second image.

   The system displays the length (**D2**) and area (**A2**) measurements for the second traced structure above the calculated volume (**V**) in the Measured Results.

## Thyroid Volume

You can perform Thyroid volume measurements on either two or three images in Dual mode or on two separate 2D-mode images. Thyroid volume requires two image planes and three distance measurements: width, height, and length. The system uses the following formula to calculate the thyroid volume:

VT=WxHxLx0.479cc.

**To perform the thyroid volume measurement:**

1. Activate the measurement function.
2. Select **Thyroid** from the 2D-mode measurement methods.

   The system displays a width (**W**), height (**H**), length (**L**), and thyroid volume (**VT**) in the Measured Results.
3. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.

   The system anchors the marker and displays the second marker.
4. Roll the trackball to position the second measurement marker and then press the **SET** key.

   The system anchors the marker, displays the width (**W**) in the Measured Results, and displays the next measurement marker.
5. Repeat steps 3 and 4 to measure the height (**H**) of the structure.

   If you are in Dual- or Split (B+B) mode, roll the trackball to another frozen image. Otherwise, press the **FREEZE** key on the control panel, scan to obtain another image, and press the **FREEZE** key again. Press the **CALIPER** key on the control panel.
6. Roll the trackball to position the marker for the length and then press the **SET** key.

   The system anchors the marker and displays the second marker.
7. Roll the trackball to position the second marker and then press the **SET** key.

   The system displays the width (**W**), height (**H**), and length (**L**) above the calculated thyroid volume (**VT**) in the Measured Results.

Use the system presets to specify Thyroid as the default 2D-mode measurement method for the Thyroid exam.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Thyroid
▶ Measurement and Report Preset
▶▶ Measurement Method
▶▶▶ Default Method by Mode

### Thyroid Volume

Brunn, J., Block, U., Ruf, G., Bos, I., Kunze, W.P., Scriba, P.C. "Volumetry of the Lobe of the Thyroid Gland by Means of Realtime Sonography." Deutsche MedWochenschrift, 106, 1981.

## Residual Volume

Use the Residual Volume measurement method to determine a micturated volume by subtracting a post-void volume from a pre-void volume. Values for all three measured volumes display in the Measured Results.

The system uses an LxDxW volume calculation that requires you to position three sets of measurement markers. Measurements are performed on two images acquired in separate scan planes. You can determine a Residual Volume using two single 2D-mode images or images acquired in Dual or 4B mode.

### To determine a residual volume:

**Note:** The procedure below assumes you are imaging in Dual or 4B mode. If single 2D images are used, perform the first five steps below on one image. Unfreeze the system. If you press the **ESCAPE** key, the system erases the measurements. Acquire and freeze the second image. Repeat steps 1 and 2, then begin the procedure with step 6. The system displays the saved values from the first image and combines them with the measured values from the second image to calculate the volumes.

1. Activate the measurement function.
2. Select **Residual** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker at the beginning of the distance measurement and then press the **SET** key.

   The system anchors the marker and displays a second measurement marker.
4. Roll the trackball to position the second marker and then press the **SET** key.

   The system anchors the marker and displays the first measurement marker of the second set of markers.
5. Repeat steps 3 and 4 to measure a second distance.

   The system displays the values of both distances in the Measured Results.
6. On the second image, roll the trackball to position the first measurement marker for the third distance and then press the **SET** key.

   The system anchors the marker and displays a second measurement marker.
7. Roll the trackball to position the second marker and then press the **SET** key.

   The system displays the width (**W**) below the depth (**D**) and length (**L**) measurements. The system also calculates and displays the pre-void (**PreV**) volume in the Measured Results.

8. Repeat steps 1 through 7 to determine the post-void volume. If performing the measurements on single 2D images rather than in Dual or 4B mode, refer to the note at the beginning of the procedure.

   The system calculates the second volume and displays the pre-void (**PreV**), post-void (**PostV**), and micturated volumes (**MicV**) in the Measured Results. The micturated volume is the difference between the pre-void and post-void volumes.

**Residual Urine Volume**

Rifkin, Matthew D., M.D. "Urinary Bladder Measurements." Chapter 16 in Atlas of Ultrasound Measurements. B. B. Goldburg and A. B. Kurtz. Chicago: Year Book Medical Publishers. 1990.

# Making a One-Plane Volume Measurement

When measurements made in one plane are used to calculate a volume, the system assumes one measurement to be the same for the second plane. There are three methods for obtaining a one-plane volume:

- 1Pl LxD
- 1Pl Ellipse
- 1Pl Disk

## LxD Method

The system calculates one-plane volume using two orthogonal diameter measurements in one plane; the diameter in the second plane is assumed to have the same measurement as the first plane. The system uses the following formula to calculate the volume, based on length and diameter:

$$\text{Volume} = \frac{\left(\pi \times L \times D^2\right)}{6}.$$

The system uses the second measurement (step 5) to determine the value of D2. Therefore, make the second measurement on the axis common to both planes.

**To obtain a one-plane volume using the length and diameter method:**

1. Activate the measurement function.
2. Select **1Pl LxD** from the 2D-mode measurement methods.

   The system displays two distances (**D1**, **D2**) and a volume (**V**) in the Measured Results.
3. Roll the trackball to position the first measurement marker at the beginning of the axis and then press the **SET** key.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to position the second measurement marker to indicate the end of the axis and then press the **SET** key.

   The system anchors the second marker, updates the length (**D1**), and displays the first measurement marker in the second caliper set.
5. Repeat steps 3 and 4 to measure the common axis.

   When you have completed the second axis measurement, the system displays the length (**D1**), depth (**D2**), and calculated volume (**V**) in the Measured Results.

## Ellipse Method

To calculate a one-plane volume using the Ellipse method, perform an area measurement and identify the axis common to both planes. The system uses the following formula to calculate the volume:

$$\text{Volume} = \frac{\left(8 \times A^2\right)}{3\pi \times L},$$

where L is the axis common to both planes.

**To obtain a one-plane volume measurement using an ellipse:**

1. Activate the measurement function.
2. Select **1Pl Ellipse** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker on the axis that is common to both planes and then press the **SET** key.

   The system anchors the marker, displays an ellipse, and updates diameters (**D1**, **D2**), area (**A**), circumference (**C**), and volume (**V**) in the Measured Results. The dotted line of the ellipse represents the axis common to both planes.
4. Roll the trackball to adjust the axis that is common to both planes, diameter **D1**, and then press the **SET** key.
5. To adjust the shape of the ellipse along diameter **D2**, roll the trackball and then press the **SET** key.
6. Roll the trackball to position the ellipse on the image and then press the **SET** key.

   The system displays diameters (**D1**, **D2**), area (**A**), circumference (**C**), and volume (**V**) in the Measured Results.

## Disk Method

To calculate a one-plane volume using the Disk method, use the trackball to trace a structure and then position an axis line along which the disks will be calculated.

**To obtain a one-plane volume using a disk measurement:**

1. Activate the measurement function.
2. Select **1Pl Disk** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key.

   The system anchors the first marker and activates a second marker.
4. Roll the trackball to create a trace of the structure with the second marker.
5. To complete the trace, press the **SET** key.

   The system draws a line across the structure, signifying the axis along which the disks will be calculated.
6. Roll the trackball to position the axis line and then press the **SET** key.

   The system displays the area (**A**), circumference (**C**), diameter (**D**), and volume (**V**).

# General M-Mode Measurements and Calculations

The M-mode measurement function includes distance, heart rate, slope, velocity, and time measurements and calculations for volume flow and ratios.

## General Caliper Performance in M-Mode

**Note:** Press the **FREEZE** key on the control panel before performing a measurement on an M-mode sweep.

| To: | Perform this action: |
|---|---|
| Anchor a marker | Press the **SET** key on the control panel. |
| Complete a measurement | Press the **SET** key on the control panel. |
| Make another measurement | Press the **CALIPER** key on the control panel after the measurement is complete. |
| Exit the measurement function | Press the **ESCAPE** key or the **FREEZE** key on the control panel to unfreeze the image. |

## Making a Distance Measurement

The distance measurement, which calculates the length of a straight line between two measurement markers, is the default measurement for M-mode. Use the system presets to change the default measurement method.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset
▶▶Measurement Method
▶▶▶M-mode

**To make a distance measurement:**

1. Activate the measurement function.
2. Select **Distance** from the M-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to position the second measurement marker and then press the **SET** key to complete the measurement.

   The system automatically updates the distance (**D**) measurement in the Measured Results.

## Making a Heart Rate Measurement

Determine the heart rate by delineating one heart cycle with the measurement markers that display as vertical lines.

**To make a heart rate measurement:**

1. Activate the measurement function.
2. Select **HR** from the M-mode measurement methods.

   The system displays the first measurement marker.
3. Roll the trackball to position the marker at the beginning of the cardiac cycle and then press the **SET** key.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to position the second measurement marker at the end of the cardiac cycle and then press the **SET** key.

   As the marker is moved, the system updates the heart rate (**HR**) and time (**T**) in the Measured Results.

## Making a Time Measurement

The time method measures the change in time between two points. Time is calculated on the horizontal axis. The measurement markers display as vertical lines.

**To make a time measurement:**

1. Activate the measurement function.
2. Select **Time** from the M-mode measurement methods.
3. Roll the trackball to position the first measurement marker on the image and then press the **SET** key.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to position the second measurement marker and then press the **SET** key.

   As the marker is moved, the system updates Time (**T**) in the Measured Results.

## Making Slope and Velocity Measurements

Slope and velocity both measure the change in distance over time, as determined by two distance measurement markers.

**To make a slope or velocity measurement:**

1. Activate the measurement function.
2. Select **Slope** or **Velocity** from the M-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key.

   The system anchors the marker and displays the second measurement marker.

4. Roll the trackball to position the second marker to the right of the first marker and then press the **SET** key.

   For the slope measurement, the system displays the slope (**S**) in the Measured Results.

   For the velocity measurement, the system displays the distance (**D**), time (**T**), and velocity (**V**) in the Measured Results.

# Report Features

For exam types with a patient report, the system transfers labeled measurements and calculations from a Measurement Menu on the image screen to a report.

The system also transfers information from the patient data form into the report. You can annotate the report and edit system-supplied data. You can edit measurements and calculations only if the report includes a worksheet (Cardiac, OB, and Early OB exams).

**[2] Instructions for Use**

| | |
|---|---|
| OB | Ch B2 |
| Cardiac | Ch B6 |

### To access a patient report:

**Note:** Patient reports are available with the following exam types: **OB**, **Early OB**, **GYN**, **Ortho**, **Cardiac**, and **Urology**. For software versions 2.0 and higher: Patient reports are also available with the following exam types: **EM** and **Rectal**.

1. Press **F2** on the keyboard at any time during an exam with a report or roll the trackball to highlight **Report** at the bottom of the Measurement Menu and then press the **SET** key**.**

   The system displays the patient report.

2. If the patient report has more than one page, roll the trackball to **Prev** or **Next** at the bottom of the report and then press the **SET** key.
3. To redisplay the image screen, press the **ESCAPE** key on the control panel.

### To use a drop-down box:

1. Roll the trackball to position the pointer in the drop-down box and then press the **SET** key.
2. Roll the trackball to highlight the selection and then press the **SET** key.

### To use a text entry field:

1. Roll the trackball to the text entry field and then press the **SET** key.
2. Use the keyboard to enter data.

# Annotating a Report

There are two methods for entering text into the **Comments** section of a patient report. You can enter text from the keyboard or insert comments that you have pre-defined in the system presets. You can edit comments after placing them in the report.

**Note:** If the report has more than one page, you must access the page containing the **Comments** field before the system will display the comments.

### To enter text:

1. When a patient report is displayed, roll the trackball to place the text cursor at the required position in the **Comments** field of the report.
2. Enter text using the keyboard.

**Note:** Enter your comments as a single paragraph. Do not use the **ENTER** key on the keyboard to separate lines of comments.

### To insert pre-defined comments:

**Note:** Use the system presets to pre-define comments for each exam type.

1. When a patient report is displayed, roll the trackball to the **Comments** button and then press the **SET** key.

   A list of available phrases displays on the screen.

2. Roll the trackball to highlight a phrase and then press the **SET** key.

   The system places the phrase in the **Comments** field of the report.

   **Note:** When adding new comments to existing comments, roll the trackball to position the pointer at the end of the existing text in the **Comments** field and then press the **SET** key.

3. Continue entering phrases. When finished, press the **ESCAPE** key on the control panel to exit.

   The system removes the list of phrases from the screen.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurement and Report Preset
▶▶ Comments Library for Report
▶ Customize Keys

# Abdominal, Breast, Thyroid, and Testicle Measurements and Calculations

All general measurements and calculations in 2D-mode and M-mode are available for the Abdominal, Breast, Thyroid and Testicle exam types. These exam types do not have reports.

Use the system presets to customize each of these exam types.

- Select the default measurement method for each mode.
- Select the default method for each type of measurement.
- Select the measurement methods that display for each mode and the order in which they display.

**[2] Instructions for Use**

General Measurements:
2D-mode B1-20
M-mode B1-36

**System Reference**

System Presets Ch 3

**F6**

M&R

# Gynecology Measurements and Calculations

All general measurements and calculations in 2D-mode and M-mode are available for use with the Gynecology exam type. In addition, the system has measurement labels in 2D-mode for specific use with the Gynecology exam. Use the system presets to create measurement labels and customize the Gynecology patient report.

**[2] Instructions for Use**

General Measurements:
2D-mode B1-20
M-mode B1-36
Exam-specific:
Follicle B1-44

## Customizing Gynecologic Measurements and Reports

Use the system presets to customize the Gynecological exam.

- Select the default measurement method for each mode.
- Select the default measurement method for each type of measurement.
- Select the measurement methods that display for each mode and the order in which they display.
- Select the measurement method for follicle evaluation.
- Enable the display of operator and referring physician information in the patient report.
- Establish user-defined labels for 2D-mode.
- Define the phrases (Comments Library) for inclusion in the patient report.
- Display only the labels with measured values in the Measured Results and patient report.
- Display all the labels (with measured values and without measured values) in the Measured Results and patient report.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurement and Report Preset

# Gynecology ▪ Measurement Menu

The Gynecology exam Measurement Menu displays on the left side of the image screen when the measurement function is active. The menu indicates which measurement method is currently in use. It also contains system-defined measurement labels and any user-defined measurement labels.

# Gynecology ▪ 2D-Mode Measurement Labels

In addition to system-defined 2D-mode measurement labels, you can define up to three 2D-mode measurement labels. These labels display in the Measurement Menu and in the patient report with the measured result, when assigned.

| Measurement Label | Description | Measurement Method Options |
|---|---|---|
| Uterus<br>Length<br>Depth<br>Width | Measurements of the uterus. | Distance |
| Endometrium | Thickness of the endometrium. | Distance |
| Cervix | Length of the cervix. | Distance |
| Lt Ovary<br>Length<br>Depth<br>Width | Measurements of the left ovary. The system automatically calculates the volume when all three distance measurements have been performed. The volume displays in the patient report and in the Measured Results. | Distance |
| Rt Ovary<br>Length<br>Depth<br>Width | Measurements of the right ovary. The system automatically calculates the volume when all three distance measurements have been performed. The volume displays in the patient report and in the Measured Results. | Distance |
| Lt Fol<br>#1 through #15 | Measurements of the left ovarian follicle. Measured values for up to 15 follicles are transferred to the patient report. | Method selected in the system presets. |
| Rt Fol<br>#1 through #15 | Measurements of the right ovarian follicle. Measured values for up to 15 follicles are transferred to the patient report. | Method selected in the system presets. |
| xxxx | A user-defined label. You can define up to three 2D-mode measurement labels to correspond to a measurement method. Four measurement methods are available: distance, area, circumference, and volume. | The 2D-mode measurement method assigned in the system presets. |

# Follicle Measurements

Before taking a follicle measurement, select one of the following measurement methods in the system presets to customize the Gynecology exam:

- **Distance**
- **2DistAve** – an average of two distance measurements
- **3DistAve** – an average of three distance measurements
- **Area**
- **Circumference**
- **Volume**

The system transfers labeled values for up to 15 left and 15 right follicle measurements into the patient report.

**To perform a follicle measurement:**

1. Activate the measurement function.
2. If necessary, access the page in the Measurement Menu containing the **Lt Follicle** and **Rt Follicle** measurements.
3. Roll the trackball to select the appropriate **Lt** or **Rt Follicle #** in the Measurement Menu and then press the **SET** key.

   The system activates the follicle measurement method selected in the system presets and displays the first measurement marker on the image.
4. Roll the trackball to position the first measurement marker to the beginning point and then press the **SET** key.
5. Perform the measurement according to the activated method.

   The system assigns the measurement value to the selected follicle number and transfers the values to the patient report.
6. Repeat steps 3 through 5 for each follicle.

**[2] Instructions for Use**

General Measurements:
2D-mode B1-20
M-mode B1-36

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurement and Report Preset
▶▶ Measurement Order

# Gynecology Patient Report

The Gynecology exam has a one-page patient report. The system transfers labeled measurements from the Gynecology Measurement Menu on the image screen to the patient report. The system also loads information from the patient data form into the report. You can annotate the report.

Use the system presets to select measurements to be included in the Gynecology patient report. The unit of measure for **Follicles** depends on the measurement method selected in the system presets.

**System Reference**

System Presets Ch 3

**To access the Gynecology patient report:**

1. During a GYN exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** in the Measurement Menu and then press the **SET** key.

   The system displays the **Data** tab of the Gynecology patient report.

2. Roll the trackball to the **Description** tab and then press the **SET** key.
3. To redisplay the image screen, press the **ESCAPE** key or roll the trackball to **Return** at the bottom of the report and then press the **SET** key.

**F6**

M&R
▶ Measurement and Report Preset
▶▶ Measurement Order
▶▶▶ Follicle Measurement Method

**To use a drop-down box:**

1. Roll the trackball to position the pointer in the drop-down box and then press the **SET** key.
2. Roll the trackball to highlight the selection and then press the **SET** key.

**To use a text entry field:**

1. Roll the trackball to the text entry field and then press the **SET** key.
2. Use the keyboard to enter data.

# Gynecology Data Tab

The first tab of the Gynecology patient report contains information entered on the patient data form for the GYN exam type. The Data tab may contain measurement details for 2D-mode if abbreviated display of results has not been selected in the system presets.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurement and Report Preset
▶▶ Display Item

## Gynecology Description Tab

The second tab of the Gynecology patient report contains drop-down boxes with descriptive data. Selections are shown below.

| Report Item | Selections |
|---|---|
| Uterus | WNL<br>Fibroid<br>Atrophic<br>Septated<br>Bicornuate |
| Right Adnexa | WNL<br>Absent<br>Mass<br>(blank) |
| Left Adnexa | WNL<br>Absent<br>Mass<br>(blank) |
| Cul de Sac | WNL<br>Fluid Seen<br>No Fluid Seen |
| Uterine Mass | None<br>Calcification(s)<br>Solid<br>Complex<br>Cystic<br>Yes |
| Right Ovary | WNL<br>Absent<br>Not Seen |
| Left Ovary | WNL<br>Absent<br>Not Seen |

# Orthopedic Measurements and Calculations

All general measurements and calculations in 2D-mode and M-mode are available for use with the Orthopedic exam type. In addition, the Orthopedic exam has a calculation for **Hip Angle**. Hip Angle is an angle calculation designed for examination of infant hips. The Orthopedic exam also has specific 2D-mode measurement labels and a Sonographic Infant Hip Classification patient report.

Use the system presets to customize the Orthopedic exam.

- Select the default measurement method for each mode.
- Select the default method for each type of measurement.
- Select the measurement methods that display for each mode and the order in which they display.
- Customize display options and enable operator and referring physician information for the patient report.
- Define the phrases (Comments Library) for inclusion in the patient report.
- Display only the labels with measured values in the Measured Results and patient report.
- Display all the labels (with measured values and without measured values) in the Measured Results and patient report.

**[2] Instructions for Use**

General Measurements:
2D-mode B1-20
M-mode B1-36
Exam-specific:
Hip Angle B1-48

**System Reference**

System Presets Ch 3

## Orthopedic ▪ 2D-Mode Measurement Labels

The following describes measurement labels for 2D-mode measurements when the Orthopedic exam is active. These labels display in the Measurement Menu.

| Measurement Label | Description | Measurement Method Options |
|---|---|---|
| R Hip Angle | Right hip angle | Hip Angle |
| L Hip Angle | Left hip angle | Hip Angle |

# Measuring a Hip Angle

The Hip Angle measurement requires the placement of three intersecting lines to determine two angles. The first line is called the ***reference line***. The second line establishes the alpha angle (α), and the third line establishes the beta angle (β). The system calculates and displays angles α and β.

**To measure a hip angle:**

1. Activate the measurement function.
2. Roll the trackball to **R Hip Angle** in the Measurement Menu and then press the **SET** key on the control panel.
3. Roll the trackball to position the first marker at point a and then press the **SET** key.

   The system anchors the marker and displays a second marker.
4. To define the direction of the reference line, roll the trackball to position the second marker so that the line intersects point b and then press the **SET** key.

   The system anchors the reference line and displays a new marker.
5. To create the line for the alpha (**α**) angle:

   a. Roll the trackball to position the marker at point c and then press the **SET** key.

   The system anchors the marker and displays a new marker.

   b. To draw the alpha (**α**) angle line, roll the trackball so that the line intersects point d and then press the **SET** key.

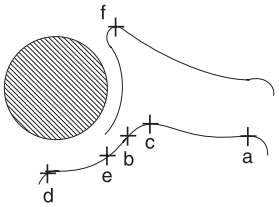
   The system anchors the line and displays a new marker.
6. To create the line for the beta (**β**) angle:

   a. Roll the trackball to position the marker at point e and then press the **SET** key.

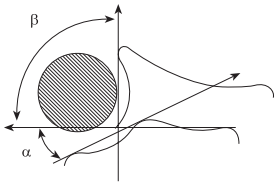
   The system anchors the marker and displays a new marker.

   b. To draw the beta (**β**) angle line, roll the trackball so that the line intersects point f and then press the **SET** key.

   The system anchors the line and displays the **α** angle and **β** angle in the Measured Results and the Graf sonometer.
7. Roll the trackball to **L Hip Angle** in the Measurement Menu and then press the **SET** key. Repeat steps 3 through 6.




Points a and b define the reference line. Points c and d establish the line used for the α angle, and points e and f establish the line used for the β angle.



# Orthopedic Report

The Orthopedic exam has a one-page report for the Sonographic Infant Hip Classification.

**To access the patient report:**

1. During an Orthopedic exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** on the Measurement Menu and then press the **SET** key.
2. To redisplay the image screen, press the **ESCAPE** key or roll the trackball to **Return** at the bottom of the report and then press the **SET** key.

**To use a drop-down box:**

1. Roll the trackball to position the pointer in the drop-down box and then press the **SET** key.
2. Roll the trackball to highlight the selection and then press the **SET** key.

**To use a text entry field:**

1. Roll the trackball to the text entry field and then press the **SET** key.
2. Use the keyboard to enter data.

## Orthopedic ▪ Descriptive Data

The patient report contains drop-down boxes with descriptive data. Selections are shown below.

| **Report Item** | **Selections (right)** | **Selections (left)** |
|---|---|---|
| Osseous Profile | (Blank)<br>I : Good<br>II : Deficient<br>D : Deficient<br>III : Poor<br>IV : Poor | (Blank)<br>I : Good<br>II : Deficient<br>D : Deficient<br>III : Poor<br>IV : Poor |
| Osseous Acetabulum | (Blank)<br>I : Sharp<br>II : Round<br>D : Round/Flat<br>III : Flat<br>IV : Flat | (Blank)<br>I : Sharp<br>II : Round<br>D : Round/Flat<br>III : Flat<br>IV : Flat |
| Cartilaginous Acetabulum | (Blank)<br>I : Narrow<br>II : Wide/Overlapped<br>D : Everted<br>III : Everted Echo Free<br>III : Everted Echo Poor<br>IV : Everted | (Blank)<br>I : Narrow<br>II : Wide/Overlapped<br>D : Everted<br>III : Everted Echo Free<br>III : Everted Echo Poor<br>IV : Everted |
| Type | (Blank)<br>Ia<br>Ib<br>IIa<br>IIb<br>IIc<br>IIIa<br>IIIb | (Blank)<br>Ia<br>Ib<br>IIa<br>IIb<br>IIc<br>IIIa<br>IIIb |

## Orthopedic References

### Hip Angle

Graf R. "Sonographic Diagnosis of Hip Dysplasia and Hip Dislocation." Revised by R. Graf from reprint. Schuler P. Graf R. 1986. "Sonographie in de Orthopädie in Braun — Günther — Schwerk." Ultraschalldiagnostick 4. Erg. Lig 7, 1986. Ecomed Verlag.

# Cranial Measurements and Calculations

All general measurements and calculations in 2D-mode and M-mode are available for the Cranial exam type. In addition to the general 2D-mode selections, the system has Area Percent Stenosis and Diameter Percent Stenosis measurements specific to the Cranial exam. The Cranial exam type does not have a report.

Use the system presets to customize the Cranial exam.

- Select the default measurement method for each mode.
- Select the default method for each type of measurement.
- Select the measurement methods that display for each mode and the order in which they display.
- Display only the labels with measured values in the Measured Results and patient report.
- Display all the labels (with measured values and without measured values) in the Measured Results and patient report.

**[2] Instructions for Use**


General Measurements:
2D-mode B1-20
M-mode B1-36
Exam-specific:
A-% Stenosis B1-52
D-% Stenosis B1-53


**System Reference**


System Presets Ch 3

## Determining an Area Percent Stenosis

The Area Percent Stenosis calculation compares cross-sectional areas of the same vessel. The system automatically performs the calculation using the following formula after you position two ellipses over the same vessel.

$$\text{Area \% Stenosis} = \left( \frac{A1 - A2}{A1} \right) \times 100 ,$$

where A1 = the larger area, A2 = the smaller area.

**To determine an area percent stenosis:**

1. During a Cranial exam, freeze the image and activate the measurement function.
2. Select **A-%Stenosis** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker and then press the **SET** key on the control panel.

   The system anchors the marker, displays an ellipse, and displays the area in the Measured Results.
4. Roll the trackball to rotate the first axis and size the ellipse and then press the **SET** key.
5. Roll the trackball to adjust the shape of the ellipse along the second axis and then press the **SET** key.

   The system displays the area of the ellipse in the Measured Results.
6. Roll the trackball to position the ellipse on the image and then press the **SET** key.
7. Unfreeze the image, and acquire and freeze a second image. Reactivate the measurement function. If you press the **ESCAPE** key, the system erases the measurements.

   The system automatically reselects **A-%Stenosis**.
8. For the second ellipse, repeat steps 3 through 6.

   The system displays the areas for the two ellipses (**A1**, **A2**), and the calculated area percent stenosis (**%Sten**) in the Measured Results**.**

## Determining a Diameter Percent Stenosis

The Diameter Percent Stenosis calculation compares diameters of the same vessel. The system automatically determines the calculation using the following formula after you obtain two diameters of the same vessel.

$$\text{Diameter \% Stenosis} = \left( \frac{D1 - D2}{D1} \right) \times 100 ,$$

where D1 = larger diameter, D2 = smaller diameter.

**To determine a diameter percent Stenosis:**

1. During a Cranial exam, freeze the image and activate the measurement function.
2. Select **D-%Stenosis** from the 2D-mode measurement methods.
3. Roll the trackball to position the first measurement marker and press the **SET** key on the control panel.

   The system anchors the marker and displays a second marker.
4. Roll the trackball to position the second measurement marker and then press the **SET** key.

   The system anchors the marker and displays the first diameter (**D1**) in the Measured Results.
5. Unfreeze the image, and acquire and freeze a second image. Reactivate the measurement function. If you press the **ESCAPE** key, the system erases the measurements.

   The system automatically reselects **D-%Stenosis**.
6. Repeat steps 3 and 4 for the second diameter (**D2**).

   The system anchors the measurement marker and displays the diameters (**D1**, **D2**) and calculated diameter percent stenosis (**%Sten**) in the Measured Results.

# B2 Obstetrical Measurements and Calculations

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# Obstetrical Measurements and Calculations

The ultrasound system has two exam types for the Obstetrical (OB) application, the **Early OB** exam and the **Standard OB** exam. Both exams use formulas for estimating menstrual age, estimating fetal weight, and determining growth ratios. Parameter labels are assigned to measured results used as parameters in these formulas. Each exam also supports multiple gestation studies.

- The **Early OB** exam is intended for **first trimester studies** and has measurement and parameter labels for use in 2D-mode.
- The **Standard OB** exam is intended for **second and third trimester studies** and has measurement and parameter labels for use in 2D-mode, including a label for the **Amniotic Fluid Index**.

The OB exams also have the capability for generating **Growth Analysis Graphs** for each OB exam. Growth Analysis compares actual fetal growth to predicted growth patterns. Graphs can display measured results from a single exam, or from data acquired over a series of exams and combined using the **Link Files** function.

All general measurements and calculations are available for the Obstetric exam type. The results of the measurements and calculations can be used to determine an estimated menstrual age and/or estimated fetal weight. These estimations are based upon ***standard*** or ***user-defined*** tables or formulas. Standard tables or formulas are system-defined, while a user-defined table or formula contains data that you have entered using the system presets.

**[2] Instructions for Use**


Growth Analysis Graphs B2-25
Link Files B2-28
General Measurements Ch B1

# Customizing Obstetrical Measurements and Reports

Use the system presets to customize the OB exam.

- Specify which labels display in the Measurement Menu and the order in which they display.
- Select the default references for tables and formulas provided by the system.
- Designate a method, direct or average, for determining parameter values.
- Customize the content of the patient report.
- Create user-defined labels for 2D-mode measurements.
- Define up to five tables and/or formulas to estimate menstrual age.
- Define up to five formulas to estimate fetal weight.
- Define up to five tables and/or formulas for growth analysis.
- Define up to five formulas for ratios of parameters.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurements and Report Preset
▶▶ Item and Reference Selection
▶▶ Display Configuration
▶▶ User-Defined

# Tables, Formulas, and Calculations to Estimate Fetal Weight and Menstrual Age

Use the system presets to select references for the tables and formulas used by the ultrasound system to calculate an estimated menstrual age and estimated fetal weight. You can also change a reference in the OB worksheet.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset
▶▶ Item and Reference Selection
▶▶▶ EFW/USMA tab
▶▶ User-defined EFW Formula

## Estimated Fetal Weight Formulas

Use the system presets or the worksheet to designate the references (authors) for the formulas that the system uses in determining estimated fetal weights (**EFW1 and EFW2**). You can also use the system presets to create up to five user-defined formulas for **EFW**.

**Note:** The calculation and display of an estimated fetal weight is dependent on the valid ranges specified by the author of an equation. Calculated values above or below the valid range display a value of xxx, such as EFW1 xxxg. If all the measurements required by the author have not been made, the system displays blanks next to the EFW label.

**EFW1 and EFW2** display in the worksheet and the patient report. **EFW1** also displays in the Measured Results after the measurements required by the designated author are made.

## Menstrual Age Tables and Formulas

You can designate the reference (author) for the table or formula that the system uses in determining an estimated menstrual age. Tables are available for the following parameters: **BPD**, **OFD**,**FTA**, **EFW**, **AXT**, **HC**, **ASD**, **ATD**, **AC**, **FL**, **HL**, **UL**, **BN**, **TL**, **FT**, **MSD**, **CRL** and **GS**. The system provides an estimated menstrual age based on estimated fetal weight if the Tokyo, Osaka, or JSUM reference is selected for EFW1 or EFW2.

**F6**

M&R
▶Measurement and Report Preset
▶▶ Item and Reference Selection
▶▶▶ EFW/USMA tab
▶▶ User-defined MA Data

You can also use the **system presets** to create up to five user-defined menstrual age tables or formulas for system- and user-defined measurements.

### Menstrual Age

Use **Item and Reference Selection** in the system presets to select the method that the system uses to estimate menstrual age for a parameter.

- **Direct** estimates a menstrual age from the most recent measurement obtained for a parameter.
- **Average** estimates menstrual age by averaging as many as five measurements obtained for a parameter. The worksheet displays the values used to calculate the average.

## Composite Menstrual Age

Use the system presets or the worksheet to select the method that the system uses for calculating a composite ultrasound menstrual age (**USMA**). The options are ***average***, one of Hadlock's eleven ***regression equations***, or a ***user-defined formula***.

The basis for an ***average*** is the estimated menstrual ages obtained from any combination of parameters. To obtain an average, the system adds the estimated menstrual ages, then divides the sum by the number of measured parameters.

Hadlock's eleven ***regression equations*** require the measurement of one or more of the following parameters: **BPD**, **HC**, **FL**, or **AC**. The required parameters display below the USMA drop-down list in the **EFW/USMA** tab.

Use **MA Data** in the system presets to define a ***user-defined formula*** for composite menstrual age.

**F6**

M&R
▶Measurement and Report Preset
▶▶ Item and Reference Selection
▶▶▶ EFW/USMA tab
▶▶ MA Data

# Indicating a Single or Multiple Study

Both the Early OB and the Standard OB exams support multiple gestational studies, providing separate measurement information for each fetus.

You can change the type of study when the Measurement function is active.

**To indicate a multiple study during measurements:**

1. Roll the trackball to highlight **Single** at the top of the Measurement Menu and then press the **SET** key.

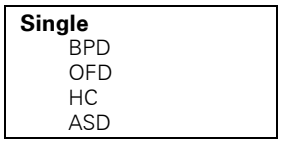
   The system displays a confirmation message.

   **Note:** You cannot change back from a multiple-gestational study to a single-gestational study. To continue imaging on a single fetus, roll the trackball to position the pointer on the **Cancel** button and then press the **SET** key.

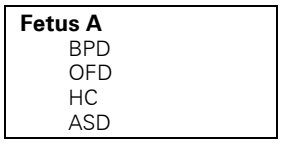
2. To change to a multiple-gestational study, roll the trackball to position the pointer on the **OK** button and then press the **SET** key.

   The system displays **Fetus A** at the top of the Measurement Menu and assigns the labeled measurement values already acquired in the current exam to Fetus A in the worksheet and the patient report.

3. Continue imaging for Fetus A or, to begin measurements on another fetus, roll the trackball to highlight **Fetus A** at the top of the Measurement Menu and then press the **SET** key.




*Example single-gestation OB Measurement Menu.*




*Example multiple-gestation OB Measurement Menu.*

# Obstetrics ▪ Measurement Menu

When the Measurement function is activated during an OB exam, the system displays the Measurement Menu on the left side of the image screen.

At the top of the menu, the system displays **Single** or, in the case of a multiple pregnancy, the label assigned to the measurements currently being made: **Fetus A**, **Fetus B**, or **Fetus C**.

The OB exam can display over 30 measurement and parameter labels on different pages of the Measurement Menu. At the bottom of the menu the system displays the number of the current page, such as **1/3**. To access the next page of labels, roll the trackball to highlight the page number and then press the **SET** key.

The Measurement Menu also provides access to the patient report, worksheet, and OB growth curve graphs. Roll the trackball to highlight the label and then press the **SET** key.

The Measurement Label menu contains system-defined parameter and measurement labels, as well as any user-defined measurement labels.

The ***Clinical menstrual age (MA)*** displays at the top of the Measured Results. The **Clinical MA** is the menstrual age based on the clinical last menstrual period (LMP) entered in the patient data form or as updated in the worksheet or in the patient report.

For MA parameter labels, a **Calculated MA** displays in the Measured Results next to each label to which a measured result is assigned.

**[2] Instructions for Use**

Measurement Menu Ch B1

Distance
Single
BPD
OFD
HC
ASD
ATD
AC
FL
HL
UL
BN
TL
FT
CL
Report
Worksheet
Graph
1/3

*Example list of 2D-mode measurement labels for OB.*

# Early OB ▪ 2D-Mode Parameter, Measurement, and Calculation Labels

The 2D-mode labels for the Early OB exam are described in this section.

**[2] Instructions for Use**

Standard OB B2-11

## Early OB ▪ Parameter Labels

The following parameter labels for 2D-mode are used to estimate menstrual age. Parameter labels display in the Measurement Menu, the worksheet, and the patient report. When assigned measured results, parameter labels display an estimated menstrual age (MA) if the measured result is within the range of measurements in the reference table.

| MA Parameter Label | Description | Measurement Method |
|---|---|---|
| **MSD** | Mean Gestational Sac Diameter | Distance |
| **CRL** | Crown Rump Length | Distance |
| **BPD** | Biparietal Diameter | Distance |
| **OFD** | Occipital Frontal Diameter. You can measure this individually or obtain it automatically from the HC measurement. | Distance |
| **AC** | Abdominal Circumference | Ellipse |
| **HC** | Head Circumference | Ellipse |
| **ASD** | Abdominal Sagittal Diameter. You can measure this individually or obtain it automatically from the AC measurement. | Distance |
| **ATD** | Abdominal Transverse Diameter. You can measure this individually or obtain it automatically from the AC measurement. | Distance |
| **AC** | Abdominal Circumference | Ellipse |
| **FL** | Femur Length | Distance |
| **HL** | Humerus Length | Distance |
| **UL** | Ulna Length | Distance |
| **BN** | Binocular Distance | Distance |
| **TL** | Tibia Length | Distance |
| **FT** | Foot Length | Distance |
| **GS** | Gestational Sac. Maximum length. | Distance |
| **FTA** | Fetal Trunk Area | Ellipse |
| User-Defined #1-5 | You can define up to five measurement labels and select a measurement method for each. The same five labels are available in both Early OB and Standard OB exams. | The 2D-mode measurement method assigned during the definition of the label in the system setups. |

## Early OB ▪ Measurement Labels

Measurement labels display on the Measurement Menu, the worksheet, and the patient report, but do not display an estimated menstrual age. User-defined labels and their accompanying measured results display as specified in the **Item and Reference Selection** menu of the system presets.

| Measurement Label | Description | Measurement Method |
|---|---|---|
| **Yolk Sac** | Yolk Sac Diameter | Distance |
| **APTD** | Anteroposterior Trunk Diameter | Distance |
| **TTD** | Transverse Trunk Diameter | Distance |
| **NT** | Nuchal Thickness | Distance |
| User-Defined #1-5 | You can define up to five measurement labels and select a measurement method for each. The same five labels are available in both Early OB and Standard OB exams. | The 2D-mode measurement method assigned during the definition of the label in the system presets. |

## Minimizing the Quantity of Labels Displayed in Measured Results

Display only the labels with measured values in the Measured Results and patient report. Display all the labels (with measured values and without measured values) in the Measured Results and patient report.

## Early OB ▪ Calculation Labels

The following calculation labels for 2D-mode are available when the Early OB exam is active. Calculation labels do not display in the Measurement Menu. The system performs the calculations once the required measurements are made, displays the calculated values in the Measured Results, and then transfers the values to the worksheet and the patient report.

| Calculation Label | Description | Required Measurements |
|---|---|---|
| **CLINICAL MA** | Menstrual Age by last menstrual period | Calculated from the LMP date. |
| **CLINICAL EDC** | Estimated Date of Confinement | Determined by LMP date. |
| **US MA** | Composite Menstrual Age by ultrasound | Determined from all Menstrual Age parameters and calculations. |
| **US EDC** | Estimated Date of Confinement by ultrasound | Determined from all ultrasound parameters and calculations. |
| **EFW1 and EFW2** | Estimated Fetal Weight | The required measurements vary depending on the selected references (authors). |
| **AXT** | Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter | APTD<br>TTD |

# Early OB ▪ M-Mode Parameter, Measurement, and Calculation Labels

The following is a description of a calculation label for M-mode measurement when the OB exam is active. This label displays in the Measurement Menu.

| M-mode Calculation Label | Description | Required Measurements |
|---|---|---|
| **FHR** | Fetal Heart Rate, in beats per minute | One cardiac cycle in M-mode |

# Standard OB ▪ 2D-Mode Parameter, Measurement, and Calculation Labels

The labels for the Standard OB exam are described in this section.

The Standard OB exam displays over 30 measurement and parameter labels on different pages of the Measurement Menu. The default arrangement places parameter labels on the first page and measurement labels on the second and third pages. Use the system presets to specify which labels display in the Measurement Menu and the order in which they display.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurements and Report Preset
▶▶ Item and Reference Selection

## Standard OB ▪ Parameter Labels

The following parameter labels for 2D-mode are used to estimate menstrual age. Parameter labels display in the Measurement Label menu and in the patient report, including the worksheet. When assigned measured results, parameter labels display an estimated menstrual age.

| MA Parameter Label | Description | Measurement Method |
|---|---|---|
| **BPD** | Biparietal Diameter. You can measure this individually or obtain it automatically from the HC measurement. | Distance |
| **OFD** | Occipital Frontal Diameter. You can measure this individually or obtain it automatically from the HC measurement. | Distance |
| **HC** | Head Circumference | Ellipse |
| **ASD** | Abdominal Sagittal Diameter. You can measure this individually or obtain it automatically from the AC measurement. | Distance |
| **ATD** | Abdominal Transverse Diameter. You can measure this individually or obtain it automatically from the AC measurement. | Distance |
| **AC** | Abdominal Circumference | Ellipse |
| **FL** | Femur Length | Distance |
| **HL** | Humerus Length | Distance |
| **UL** | Ulna Length | Distance |
| **BN** | Binocular Distance | Distance |
| **TL** | Tibia Length | Distance |
| **FT** | Foot Length | Distance |
| **FTA** | Fetal Trunk Area | Ellipse |
| User-Defined #1-5 | You can define up to five measurement labels and select a measurement method for each. The same five labels are available in both Early OB and Standard OB exams. | The 2D-mode measurement method assigned during the definition of the label in the system presets. |

## Standard OB ▪ Measurement Labels

Measurement labels display in the Measurement Menu, the worksheet, and the patient report but do not display an estimated menstrual age.
User-defined labels and their accompanying measured results also display on the worksheet and the patient report.

| Measurement Label | Description | Measurement Method |
|---|---|---|
| **CL** | Clavicle Length | Distance |
| **TC** | Thoracic Circumference | Ellipse |
| **Right RL** | Renal Length Right | Distance |
| **Left RL** | Renal Length Left | Distance |
| **Right RAP** | Renal Dimension Anterior-Posterior Right | Distance |
| **Left RAP** | Renal Dimension Anterior-Posterior Left | Distance |
| **AFI** | Amniotic Fluid Index | Distance |
| **HW** | Hemispheric Width | Distance |
| **TCD** | Transcerebellar Diameter | Distance |
| **LVW** | Lateral Ventricle Width | Distance |
| **Cist mag** | Cisterna Magna (Posterior Fossa) | Distance |
| **Cervix Len** | Cervical Length | Distance |
| **NT** | Nuchal Thickness | Distance |
| **Umb VD** | Umbilical Vein Diameter | Distance |
| **APTD** | Anteroposterior Trunk Diameter | Distance |
| **TTD** | Transverse Trunk Diameter | Distance |
| User-Defined #1-5 | You can define up to five measurement labels and select a measurement method for each. The same five labels are available in both Early OB and Standard OB exams. | The 2D-mode measurement method assigned during the definition of the label in the system presets. |

## Standard OB ▪ Calculation Labels

The following calculation labels for 2D-mode are available when the OB exam is active. Calculation labels do not display in the Measurement Menu. The system performs the calculations after the required measurements are made, displays the calculated values in the Measured Results, and then transfers the values to the worksheet and the patient report. The system displays a range of values for a ratio based on the LMP or IVF date; the calculated value is in range or out of range relative to the clinical MA.

| Calculation Label | Description | Required Measurements |
|---|---|---|
| **TCD/AC** | Ratio of Transcerebellar Diameter to Abdominal Circumference | TCD<br>AC |
| **LVW/HW** | Ratio of Lateral Ventricular Width to Hemispheric Width | LVW<br>HW |
| **AFI** | Amniotic Fluid Index. Sum of four distance measurements made on four different images. | Distance |
| **FL/AC** | Ratio of Femur Length to Abdominal Circumference | FL<br>AC |
| **HC/AC** | Ratio of Head Circumference to Abdominal Circumference | HC<br>AC |
| **FL/BPD** | Ratio of Femur Length to Biparietal Diameter | FL<br>BPD |
| **CI** | Cephalic Index<br>Short axis / long axis * 100 | BPD<br>OFD |
| **AXT** | Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter | APTD<br>TTD |
| **CORBPD** | BPD corrected by a formula to adjust the head shape | BPD |
| **EFW1**, **EFW2** | Two displays for estimated fetal weight | The required measurements vary depending on the selected reference (author). |
| **CLINICAL MA** | Menstrual Age by last menstrual period | Calculated from the LMP date. |
| **CLINICAL EDC** | Estimated Date of Confinement | Determined by LMP date. |
| **US MA** | Composite Menstrual Age by ultrasound | Determined from all Menstrual Age parameters and calculations. |
| **US EDC** | Estimated Date of Confinement by ultrasound | Determined from all ultrasound parameters and calculations. |

# Standard OB ▪ M-Mode Parameter, Measurement, and Calculation Labels

The following table shows a description of a calculation label for M-mode measurement when the OB exam is active. This label displays in the Measurement Menu.

| M-mode Calculation Label | Description | Required Measurements |
|---|---|---|
| **FHR** | Fetal Heart Rate, in beats per minute | One cardiac cycle in M-mode |

# Measuring Fetal Heart Rate

**To measure Fetal Heart Rate:**

1. During an OB exam, activate the Measurement function.
2. Roll the trackball to select the **FHR** measurement label and then follow the system-guided sequence.

# Determining an Amniotic Fluid Index

Use the Amniotic Fluid Index (AFI) measurement method to calculate an index for amniotic fluid volume. This method requires a distance measurement made in each of the four quadrants, using four separate images.

The procedure can be performed in 2D-mode, Dual mode, or 4B-mode. If 2D-mode is used, a new image must be acquired for each measurement. If Dual mode is used, one measurement can be made on each of the first two images and new images must be acquired for the last two measurements.

**To measure an Amniotic Fluid Index:**

1. During an OB exam, activate the Measurement function.
2. Roll the trackball to select **AFI** in the Measurement Menu and then press the **SET** key.
3. Roll the trackball to position the first measurement marker and then press the **SET** key.

   The system anchors the marker and displays the second marker.
4. Roll the trackball to position the second marker and then press the **SET** key.

   The system anchors the marker and displays the distance value in Measured Results.
5. Obtain additional images as required and perform steps 1 through 4 for each image until all four quadrants are measured.

   The system displays the distance value (**D**) for each quadrant. When the fourth measurement is complete, the system calculates the amniotic fluid index (**AFI**) and displays the value in Measured Results.

# Obstetrical Reports

The Obstetrical patient report has the same structure for both the Early OB exam and the Standard OB exam. The report contains three tabs.

- The **Data** tab displays information from the patient data form along with labeled measurement and calculation results for all imaging modes.
- The **Standard Description** tab provides drop-down boxes with selections describing structural observations, a comments area, and a biophysical profile for the Standard OB exam.
- The **Early Description** tab provides drop-down boxes with selections describing structural observations and a comments area for the Early OB exam.

**[2] Instructions for Use**

Measurement Menu B2-8
Growth Graphs B2-25
File Linking B2-28

The OB report supports multiple gestational reporting and growth analysis graphs. You can generate growth analysis graphs by using data only from the current exam or by linking files to combine current data with data from previous exams. You can annotate the report and edit system-supplied data such as the LMP date. Measurements can be edited in the worksheet.

**F6**

M&R
►Measurements and Report Preset
►► Item and Reference Selection
►► Display Item

Use the system presets to select measurement and parameter labels to be included in an OB Report.

**To access the patient report:**

1. During an OB exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** in the Measurement Menu and then press the **SET** key.

   The system displays the first page of the **Data** tab of the report.

2. To view different pages of the report, roll the trackball to highlight **Prev or Next** at the bottom of the page and then press the **SET** key.
3. To redisplay the image screen, roll the trackball to **Return** at the bottom of the report and then press the **SET** key.

# Multiple Gestational Reporting

When you are performing a multiple-gestation OB exam, the system maintains separate measurement and calculation results for each fetus and displays the results on separate OB report pages.

**[2] Instructions for Use**

Indicating a Single or Multiple Study B2-7

**To view information for a fetus:**

- During the Measurement function, roll the trackball to highlight **Fetus A**, **Fetus B**, or **Fetus C** at the top of the Measurement Menu and then press the **SET** key.
- While viewing a worksheet, a patient report, or a growth analysis graph, roll the trackball to select **A**, **B**, or **C** at the bottom of the page and then press the **SET** key.

# Worksheet

In addition to the general report editing capability, the OB report has a worksheet you can use to edit measurement values, menstrual age data, and reference selections.

**To access the worksheet:**

1. During the Measurement function, roll the trackball to highlight **WorkSheet** in the Measurement Menu and then press the **SET** key.
2. To view different pages of the worksheet, roll the trackball to highlight **Prev** or **Next** at the bottom of the page and then press the **SET** key.
3. To return to the image screen, roll the trackball to highlight **Return** at the bottom of the page and then press the **SET** key.

## Editing Worksheets

Use the worksheet for editing estimated menstrual age data, estimated fetal weight data and references. When editing the worksheet, you can:

- Modify the **LMP** (or **IVF**), **Clinical MA**, and **Clinical EDC** fields. These fields can also be modified in the OB Report.
- Select a **reference** (author) other than the default for determining an estimated menstrual age for each parameter and calculation.
- Select a **reference** (author) other than the default for determining an estimated fetal weight (**EFW**).
- Select the variables to be used in the **USMA** and **EFW** calculations, if an author has more than one formula.

  **Note:** An **EFW** is calculated according to the ranges specified by the author of the equation. Calculated values above or below the valid range display a value of xxx, such as EFW1 xxxg. If all the measurements required by the author have not been made, the system displays blanks next to the EFW label.

- Edit the values used for **averaging** when an averaged method is used for determining an estimated menstrual age.

  **Note:** Parameters or calculations are determined by either a **direct** measurement method or an **averaged** method. Use the system presets to designate a method:

  - ***Direct*** uses last measured value is used to estimate a menstrual age.
  - ***Average*** calculates a simple average from as many as five measurements for each parameter or calculation.

## Modify LMP, Clinical MA or Clinical EDC

When you edit either the **Clinical MA** or the **Clinical EDC**, the system determines the **LMP** and places a double asterisk ( ** ) to the left of the **LMP** field. The derived **LMP** displays as: **LMP: MO/DA/YEAR or **LMP: DA/MO/YEAR

### To modify an LMP (or IVF), Clinical MA, or Clinical EDC:

1. Roll the trackball to position the pointer on the field for the **LMP**, **Clinical MA**, or **Clinical EDC** and then press the **SET** key.
2. Use the keyboard to enter an appropriate date. The system automatically updates the corresponding fields in the worksheet, the patient report, and the patient data form.

| Editing this field: | Causes the system to recalculate: |
|---|---|
| **LMP** | Clinical MA and Clinical EDC |
| **Clinical MA** | LMP and Clinical EDC |
| **Clinical EDC** | LMP and Clinical MA |

## Select a Reference (Author)

An estimated fetal weight is calculated according to the ranges specified by the author of the equation. Calculated values above or below the valid range display a value of xxx, such as EFW1 xxxg. If all the measurements required by the author have not been made, the system displays blanks next to the EFW label.

The system determines the estimated menstrual age or estimated fetal weight based on the selected author's formulas or tables.

### To select a reference:

1. Roll the trackball to position the pointer on the name of the reference for the parameter or calculation label and then press the **SET** key.
2. Roll the trackball to position the pointer on the author's name and then press the **SET** key.

   The system uses the selected author's formulas or tables to recalculate an estimated age or fetal weight and updates the resulting value in the Measured Results, the worksheet, and the patient report.

## Delete Measurements

### To delete a measurement used for averaging:

1. Roll the trackball to the value used for averaging and then press the **SET** key.

   The system highlights the value.
2. Use the keyboard to delete the value and then press the **ENTER** key.

   The system updates the averaged value based on the remaining measurements.

# Early OB Patient Report

The patient report for the Early OB exam has three tabs, each of which may have multiple pages. The report includes data from the patient data form, measured results obtained during an exam that are assigned to a label, and selected descriptive data.

Use the system presets to select specific measurement, parameter, and calculation labels and patient data form entries to include in the OB Report.

**F6**

M&R
▶Measurements and Report Preset
▶▶ Item and Reference Selection
▶▶ Display Configuration

## Descriptive Data Fields ▪ Early Description Tab

The Early Description tab of the OB patient report contains descriptive data fields. Options for each field are shown in the following table:

| Descriptive Data Fields | Options | Descriptive Data Fields | Options |
|---|---|---|---|
| **Viability** | **(Blank)**<br>**Yes**<br>**No**<br>**Not Applicable** | **Fetal Pole** | **(Blank)**<br>**Seen**<br>**Not Seen**<br>**Multiple** |
| **Uterus** | **(Blank)**<br>**Normal**<br>**Anteflexed**<br>**Retroflexed**<br>**Fibroid(s)**<br>**Abnormal** | **Cul-de-sac Fluid** | **(Blank)**<br>**Sm Amount**<br>**Lg Amount**<br>**None** |
| **Cervix** | **(Blank)**<br>**Normal**<br>**Abnormal**<br>**Incompetent** | **Adnexa** | **(Blank)**<br>**Seen**<br>**Not Seen**<br>**Mass Rt**<br>**Mass Lt** |
| **Gestational Sac** | **(Blank)**<br>**Intrauterine**<br>**Extrauterine**<br>**Not Seen**<br>**Multiple** | | |

# Standard OB Patient Report

The patient report for the Standard OB exam includes data from the patient data form, measured results obtained during an exam that have been assigned to a label, and selected descriptive data.

Use the system presets to select specific measurement, parameter, and calculation labels and patient data form entries to include in the Standard OB Report.

**F6**

M&R
▶Measurement and Report Preset

## Descriptive Data Fields ▪ Standard Description Tab

The Standard Description page of the Standard OB patient report contains descriptive data fields. The Biophysical Profile box at the right of this screen contains the fields shown in the following table. Next to each field is a number, between two boxes. Example: Breathing ▼ 2 ▲

| Biophysical Profile | Options |
|---|---|
| **Breathing** | **0, 1, 2** |
| **Tone** | **0, 1, 2** |
| **Movement** | **0, 1, 2** |
| **AFV** | **0, 1, 2** |

- To increase the number for a field, roll the trackball to position the pointer on the arrow to the right of the number and then press the **SET** key.
- To decrease the number for a field, roll the trackball to position the pointer on the arrow to the left of the number and then press the **SET** key.

The system displays a total of the values for all four fields.

| Descriptive Data Field | Options | Descriptive Data Field | Options |
|---|---|---|---|
| Fetal Heart | (Blank)<br>Motion Seen<br>No Motion Seen<br>Not Applicable | Spine Lumbar | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |
| Fetal Number | (Blank)<br>Singleton<br>1 of 2<br>2 of 2<br>Multiple | 4 CH Heart | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |
| Fetal Position | (Blank)<br>Vertex<br>Breech<br>Transverse<br>Oblique<br>Variable | Aortic Arch | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |
| 3-V Cord | (Blank)<br>Yes<br>No | Great Vessels | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |
| AF Volume | (Blank)<br>Adequate<br>Increased<br>Decreased | 4 Extremities | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |
| Placenta Grade | (Blank)<br>0<br>1<br>2<br>3 | Diaphragm | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |
| Placenta Location | (Blank)<br>Anterior<br>Posterior<br>Fundal<br>Right<br>Left | Abdominal Wall | (Blank)<br>Seen<br>Previously Seen<br>Not Seen<br>Abnormal |

| Descriptive Data Field | Options | Descriptive Data Field | Options |
|---|---|---|---|
| **Previa** | **(Blank)**<br>**None**<br>**Low-lying**<br>**Complete** | **Stomach** | **(Blank)**<br>**Seen**<br>**Previously Seen**<br>**Not Seen**<br>**Abnormal** |
| **Face** | **(Blank)**<br>**Seen**<br>**Previously Seen**<br>**Not Seen**<br>**Abnormal** | **Bowel Pattern** | **(Blank)**<br>**Seen**<br>**Previously Seen**<br>**Not Seen**<br>**Abnormal** |
| **Spine-Neck** | **(Blank)**<br>**Seen**<br>**Previously Seen**<br>**Not Seen**<br>**Abnormal** | **Bladder** | **(Blank)**<br>**Seen**<br>**Previously Seen**<br>**Not Seen**<br>**Abnormal** |
| **Spine-Thoracic** | **(Blank)**<br>**Seen**<br>**Previously Seen**<br>**Not Seen**<br>**Abnormal** | **Genitalia** | **(Blank)**<br>**Not Seen**<br>**Male**<br>**Female**<br>**Hydrocele** |

# Annotating a Report

There are two methods for entering text into the **Comments** section of a patient report. You can enter text from the keyboard or insert comments that you have pre-defined in the system presets. You can edit comments after placing them in the report.

**Note:** If the report has more than one page, you must access the page containing the **Comments** field before the system will display the comments.

### To enter text:

1. When a patient report is displayed, select the **Standard Description** or **Early Description** tab.
2. Roll the trackball to place the text cursor at the required position in the **Comments** field of the report and then press the **SET** key.
3. Enter text using the keyboard.

**Note**: Enter your comments as a single paragraph. Do not use the **Enter** key on the keyboard to separate lines of comments.

**F6**

M&R
►Measurement and Report Preset
►► Comments Library for Report

### To insert pre-defined comments:

**Note:** Use the system presets to pre-define comments for each exam type.

1. When a patient report is displayed, select the **Standard Description** or **Early Description** tab.
2. If you are adding comments to existing comments, position the cursor where you want to add the new comment.
3. Roll the trackball to the **Comments** button and then press the **SET** key.

   A list of available phrases displays on the screen.
4. Roll the trackball to the appropriate phrase and then press the **SET** key.
5. Roll the trackball to **OK** and then press the **SET** key.

   The system places the phrase in the **Comments** field of the report.

# Growth Analysis Graphs

A growth analysis graph displays curves or lines that indicate predicted fetal growth patterns according to the selected reference for a parameter, measurement, or calculation label. The system plots the measured results obtained for measurement, parameter, and calculation labels on the graphs.

A graph can display information acquired in the current exam only, or current information combined with data from earlier exams. Information can be graphed and displayed for up to ten exams. Use the Link Files function to combine data from multiple exams.

**System Reference**


| | |
|---|---|
| Link | B2-28 |
| References | Ch 9 |


## Labels ▪ Growth Analysis Graphs

| Graph | Description | References |
|---|---|---|
| **MSD** | Mean Gestational Sac Diameter | Rempen(EV) |
| **CRL** | Crown Rump Length | Hadlock, Robinson, Hansmann, Rempen(EV), ASUM, JSUM, Osaka, Tokyo |
| **BPD** | Biparietal Diameter | Hadlock, Merz, Lasser(EV), Hansmann, Rempen(EV), ASUM, Chitty (O-I), Chitty (O-O), JSUM, Osaka, Tokyo |
| **OFD** | Occipital Frontal Diameter | Hansmann, ASUM, Chitty |
| **HC** | Head Circumference | Hadlock, Merz, Hansmann, ASUM, Chitty |
| **AC** | Abdominal Circumference | Hadlock, Merz, Jeanty, ASUM, Chitty (Pltd), JSUM |
| **FL** | Femur Length | Jeanty, Hadlock, Merz, Hansmann, ASUM, JSUM, Osaka, Tokyo |
| **HL** | Humerus Length | Jeanty, Merz, Hansmann, ASUM, Osaka |
| **UL** | Ulna Length | Jeanty, Merz, Hansmann |
| **TL** | Tibia Length | Jeanty, Merz, Hansmann |
| **FT** | Foot Length | Mercer |
| **TC** | Thoracic Circumference | Chitkara |
| **CL** | Clavicle Length | Yarkoni |
| **Left RL**, **Right RL** | Renal Length, left and right | Bertagnoli, Hansmann |
| **Left RAP**, **Right RAP** | Renal Dimension Anterior-Posterior, left and right | Bertagnoli, Hansmann |
| **FTA** | Fetal Trunk Area | Osaka |
| **AXT** | Anteroposterior Trunk Diameter multiplied by Transverse Trunk Diameter | Tokyo |
| **GS** | Gestational Sac | Tokyo |
| **AFI** | Amniotic Fluid Index | Moore |

| Graph | Description | References |
|---|---|---|
| **1EFW**, **2EFW** | Estimated Fetal Weight | Hadlock, Schuhmacher, Jeanty, Yarkoni, Osaka, JSUM, Tokyo |
| **HC/AC** | A ratio of Head Circumference to Abdominal Circumference | Campbell |
| **FL/AC** | A ratio of Femur Length to Abdominal Circumference | Hadlock |
| **FL/BPD** | A ratio of Femur Length to Biparietal Diameter | Hohler |
| **CI** | Cephalic Index | Hadlock, Chitty |
| **TCD/AC** | A ratio of Transcerebellar Diameter to Abdominal Circumference | Meyer |
| User-Defined #1-5 | A user-defined 2D-mode parameter label | User-defined |

**To view a Growth Analysis Graph:**

1. Access the growth analysis graph using one of the two following methods:
   - During the Measurement function in an Obstetrical exam, roll the trackball to highlight **Graph** in the Measurement Menu and then press the **SET** key.
   - While viewing the worksheet or the patient report, roll the trackball to highlight **Graph** at the bottom of the page and then press the **SET** key.

   The system displays a graph.
2. To view another graph, roll the trackball to position the pointer on the arrow next to the drop-down list of measurement labels and then press the **SET** key.

   The system displays the list of measurement labels.
3. Roll the trackball to highlight the measurement you want to graph and then press the **SET** key.

   The system displays a dot representing the value in the patient report for that measurement. The dot is plotted against measurement values in the vertical axis and clinical MA in the horizontal axis.
4. To change the reference author, roll the trackball to position the pointer on the arrow next to the drop-down list of references and then press the **SET** key.

   The system displays the list of growth analysis references (authors) for the selected measurement.
5. Roll the trackball and use the scroll bar as necessary to highlight the reference you want to use for the measurement and then press the **SET** key.

   The system displays a line representing the mean values for that measurement over time, and lines representing one standard deviation.
6. To bring the dot representing the measurement value into line with the growth analysis graph, adjust the LMP date.

# Linking Patient Data Files

The ***Link Files*** feature combines stored patient information from previous OB exams with current data to produce growth analysis graphs.

All exams used in growth analysis must be imported to the hard disk, and use an ***identical Patient ID***.

If files are stored on a CD, the files containing previous exam data for the current patient must be imported to the hard drive when the request for linking is made.

When a link is requested, the system compares the Patient ID for the current exam to the Patient ID for each report stored on the hard drive. Any or all of the displayed files can be selected for linking.

File linking causes the system to compare the value obtained for a measurement in the current exam to earlier results for the same measurement.

**System Reference**

System Presets Ch 3
CD Function Ch 4

**F6**

M&R
▶Measurements and Report Preset
▶▶ Customize Growth Analysis Graphs
▶▶▶ AutoStore Report Data

## Selecting Files for Linking

**To select files for linking:**

1. Roll the trackball to highlight the **Link Files** button at the bottom of the page in the worksheet, the patient report, or a growth analysis graph.

   The system displays the **Link Files** screen. The current patient name and ID display in the appropriate fields.

2. Roll the trackball to the **Search** button and press the **SET** key.
3. To include all displayed files in the link, roll the trackball to position the pointer on the **Select All** button and then press the **SET** key.
4. To include selected files in the link, roll the trackball to position the pointer on the box adjacent to the patient name and then press the **SET** key. Repeat for each file to be linked.

   The system displays a check ✓ mark next to each selected file.

5. To remove a selected file from the link, roll the trackball to the checkbox and then press the **SET** key.

   The system removes the check ✓ mark.

6. To search for additional patient files, enter the patient name in the **Patient/File Search** box, roll the trackball to the **Search** button, and then press the **SET** key.
7. When you have all the files selected, roll the trackball to highlight the **Link** option and then press the **SET** key.

   The system links measurement information from each selected file after comparing the LMP dates for all of the files. The LMP date must be the same for each exam. If the LMP is different between exams or is missing from a file, the system displays an input screen where you can specify an LMP date.

   Entering or changing the LMP date on the screen only affects the file link process, and does not change the information in the worksheet or the patient report, or stored on disk. This allows the LMP date to be adjusted to include data in the graphs, without changing the exam records.

**To view linked file data in growth graphs:**

1. Access the growth analysis graph and select a growth parameter and author from the drop-down lists.
2. To view measurement data from previous, linked exam reports, roll the trackball to **Previous** at the bottom of the screen and then press the **SET** key.

   The system displays data from both the current and previous exams on the graphs.

3. To remove previous data from graphs, deselect the **Previous** box.

# B3 Emergency Medicine Measurements and Calculations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# Emergency Medicine Measurements and Calculations

The Emergency Medicine (EM) package includes measurements, calculations, and patient reports for assessing:

- Dimensions of abdominal organs: Gall bladder wall, bile duct, and aorta
- Cardiac function: End-diastolic and end-systolic volumes and the derived ejection fraction
- Fetal Growth: Gestational sac, crown-rump length, and biparietal diameter
- Bladder dimensions for the transverse and sagittal planes

# Customizing Emergency Medicine (EM) Measurements and Reports

Use the system presets to customize the EM exam type.

**System Reference**

System Presets Ch 3

### Options for Exam Configuration Default Settings

- Select the system response when the **FREEZE** key is pressed, display CINE or activate the measurement function
- Create or edit the Pictogram List
- Create or edit the Text Annotation List

### Options for Measurements and Reports (M & R)

- Specify the shape, size, and default position for the caliper
- Specify whether the background for the Measured Results section of the screen has a different color than the image background
- Select the default measurement method for each mode
- Select the default method for each type of measurement
- Select the measurement methods that display for each mode, and the order in which they display
- Restrict the display of Measured Results to measured values or display all labels with or without measurement values
- Include or exclude physician identification in the patient report
- Define the Comments Library for the patient report
- Select the formula for determining a Bladder Volume
- Select the author for use with the menstrual age parameters.

# Emergency Medicine (EM) ▪ Measurement Menu

System-defined measurement labels for the active measurement type display in the Measurement Menu. When a measured result is assigned to a label, the label and value display in the associated section of the patient report.

The system performs 2D-mode calculations when you complete the required measurements and assigns calculation labels to the results. Calculated results display in the Measured Results section of the screen and are transferred to the associated section of the patient report.

**[2] Instructions for Use**

Distance Measurements Ch B1

# Emergency Medicine (EM) ▪ 2D-Mode Measurement Labels

| Measurement Menu Label | Description | Measurement Method |
|---|---|---|
| **GB Wall thk** | Gall bladder wall thickness | Distance |
| **Bile duct** | Bile duct | Distance |
| **Aorta** | Aorta | Distance |
| **EDV** | Left Ventricular End Diastolic Volume | 1 Plane Disk |
| **ESV** | Left Ventricular End Systolic Volume | 1 Plane Disk |
| **GS** | Gestational Sac, maximum thickness | Distance |
| **CRL** | Crown Rump Length | Distance |
| **BPD** | Biparietal Diameter | Distance |
| **Bl Trans D** | Bladder, Transverse Depth | Distance |
| **Bl Trans W** | Bladder, Transverse Width | Distance |
| **Bl Sag D** | Bladder, Sagittal Depth | Distance |
| **Bl Sag L** | Bladder, Sagittal Length | Distance |

# Emergency Medicine (EM) ▪ 2D-Mode Calculation Labels

| Calculation Label | Description | Requirements | Units |
|---|---|---|---|
| **EF** | ***Ejection Fraction*** is the ratio of the stroke volume to the end-diastolic volume:<br>EF = 100[(EDV-ESV)÷EDV]. | EDV<br>ESV | % |
| **Bladder V** | ***Bladder Volume*** is calculated from transverse or sagittal bladder measurements, or from measured results in both planes.<br>Transverse 1 Plane Volume:<br>(π x TD x TW x TW) / 6<br>Sagittal 1 Plane Volume:<br>(π x SD x SL x SL) / 6<br>Combined 2 Plane Volume:<br>(π x (TD+SD)/2 x TW x SL / 6 or<br>(π x TD x TW x SL) / 6 or<br>(π x SD x TW x SL) / 6 | Transverse Diameter<br>Transverse Width<br>Sagittal Diameter<br>Sagittal Length | mL |

## Determining a Left Ventricular End-Diastolic or End-Systolic Volume

When a volume measurement label is selected in the Measurement Menu, the default volume measurement method displays at the top, above the name of the measurement type. The ED exam uses the one-plane disk volume measurement method.

**To determine an EDV or ESV:**

1. During an **EM** exam, acquire and freeze a 2D-mode image.
2. Press the **CINE** key to activate CINE playback.
3. Roll the trackball to view an end systolic or end diastolic frame.
4. Activate the measurement function.

   The Measurement Menu displays measurement labels.
5. Roll the trackball to select **EDV** or **ESV** in the Measurement Menu and then press the **SET** key.

   The system places a measurement marker on the image, activates the **1Pl Disk** volume measurement method, and displays the area (**A**), circumference (**C**), diameter (**D**), and volume (**V**) of the structure in the Measured Results.
6. Roll the trackball to position the measurement marker to begin the volume trace and then press the **SET** key.

   The system anchors the marker.
7. Roll the trackball to create a trace of the structure. To delete (undo) a segment of the outline, rotate the **SELECT** control counterclockwise.
8. To complete the trace, press the **SET** key.

   The system connects the beginning and end points of the trace and displays a line representing the long axis.
9. Roll the trackball to position the endpoint of the long axis and then press the **SET** key.

   The system displays the volume in the Measured Results and assigns the volume value to the measurement label.

# Emergency Medicine (EM) ▪ M-Mode Calculation Labels

The system performs M-mode calculations when you complete the required measurements. The resulting values display in the Measured Results and are automatically transferred to the associated section of the patient report.

**[2] Instructions for Use**

Measuring Fetal Heart Rate Ch B2

| Calculation Label | Description | Required Measurements |
|---|---|---|
| **FHR** | Fetal Heart Rate, in beats per minute | One cardiac cycle in M-mode |

# Emergency Medicine (EM) Patient Report

The system transfers the labeled measurements and calculations from each measurement or derived calculation into the corresponding section of data, or ***tab***, of the Emergency Medicine (EM) Report. Information from the Patient Data form displays in the top two lines of the patient report.

## EM Report Data (Tabs)

The system displays an asterisk next to the name of each tab that contains report data. Report data includes descriptive fields and the measured and calculated results. Report tabs for the EM exam include:

- FAST (Focused Abdominal Sonography in Trauma)
- Aorta
- Gallbladder
- Renal
- Obstetric
- Cardiac
- Bladder
- DVT (Deep Vein Thrombosis)

# FAST Data

FAST is Focused Abdominal Sonography in Trauma. The data in this section of the report can be used during an ultrasound examination to determine whether fluid has accumulated in the abdominal cavity.

## Description of Unique Report Fields

| Field | Description | Selections |
|---|---|---|
| **Morison's pouch** | Anterior surface of the hepar and the right kidney. | **Negative fluid** |
| | | **Positive fluid** |
| | | **Not imaged** |
| **Splenorenal view** | Splenorenal | **Negative fluid** |
| | | **Positive fluid** |
| | | **Not imaged** |
| **Suprapubic view** | Bladder | **Negative fluid** |
| | | **Positive fluid** |
| | | **Not imaged** |
| **Cardiac view** | Heart | **Subcostal view** |
| | | **Parasternal view** |
| | | **Not imaged** |
| **Pericardial effusion** | Pericardial effusion | **None** |
| | | **Physiologic fluid/ epicardial fat** |
| | | **Small effusion** |
| | | **Moderate effusion** |
| | | **Large effusion** |
| **Right chest** | Right chest | **Pleural fluid** |
| | | **No pleural fluid** |
| | | **Not imaged** |
| | | **Lung sliding/ comet tail present** |
| | | **Lung sliding/ comet tail absent** |
| **Left chest** | Left chest | **Pleural fluid** |
| | | **No pleural fluid** |
| | | **Not imaged** |
| | | **Lung sliding/ comet tail present** |
| | | **Lung sliding/ comet tail absent** |

# Aorta Data

## Description of Unique Report Fields

| Field | Description |
|---|---|
| **Imaged transversely** | Check box to indicate the orientation of image. |
| **Imaged longitudinally** | Check box to indicate the orientation of image. |
| **Aorta** | Measured result |

# Gallbladder

## Description of Unique Report Fields

**Note:** If a measurement has been completed or the Description has been edited, the system inserts an asterisk mark (*).

| Field | Description |
|---|---|
| **Imaged transversely** | Check box to indicate the orientation of image. |
| **Imaged sagitally** | Check box to indicate the orientation of image. |
| **Gallstones present** | Check box to indicate the presence or the absence of gallstones. |
| **Gallstones absent** | |
| **Wall thickening present** | Check box to indicate the presence or absence of thickening of the gallbladder wall. |
| **Wall thickening absent** | |
| **Wall thickness** | Measured result |
| **Sonographic Murphy's present** | Check box to indicate the presence or absence of tenderness above the gallbladder. |
| **Sonographic Murphy's absent** | |
| **Pericholecystic fluid present** | Check box to indicate the presence or the absence of pericholecystic fluid. |
| **Pericholecystic fluid absent** | |
| **Common bile duct measured** | Measured result |
| **Common bile duct not imaged** | Check box to indicate the bile duct was not imaged. |

# Renal Data

## Description of Unique Report Fields

| Field | Description | Selections |
|---|---|---|
| **Right kidney** | Check box to indicate the orientation of the image | **Imaged coronally**<br>**Imaged transversely** |
| **Hydronephrosis** | Hydronephrosis of right kidney | **None**<br>**Mild**<br>**Moderate**<br>**Severe** |
| **Left kidney** | Check box to indicate the orientation of the image | **Imaged coronally**<br>**Imaged transversely** |
| **Hydronephrosis** | Hydronephrosis of left kidney | **None**<br>**Mild**<br>**Moderate**<br>**Severe** |

# Obstetric

## Description of Unique Report Fields

**Note:** If a measurement has been completed or the Description has been edited, the system inserts an asterisk mark (*) **except when any of LMP (IVF), Clinical MA, and/or Clinical EDC is edited.**

| Field | Description | Selections |
|---|---|---|
| **MAFP** | Maternal Alpha-Fetoprotein (Level) | Transferred from the Patient Data form |
| **Gravida** | Gravida (the number of times of pregnancy) | Transferred from the Patient Data form |
| **Para** | Para (the number of times of live birth) | Transferred from the Patient Data form |
| **AB** | Abortion (the number of times of abortion) | Transferred from the Patient Data form |
| **Ectopic** | Ectopic pregnancy (the number of times of pregnancy) | Transferred from the Patient Data form |
| **LMP** | Last menstrual period<br>When LMP is calculated from Clinical MA or Clinical EDC, the system inserts the mark ** at the beginning of the indication.<br>In-vitro Fertilization Data (IVF) may be used instead of LMP.<br>IVF = LMP + 14 Days<br>When IVF is calculated from Clinical MA or Clinical EDC, the system inserts the mark ** at the beginning of the indication. | Date transferred from the Patient Data form or selected from the drop-down calendar |
| **Clinical MA** | Clinical Menstrual Age<br>Clinical MA = StudyDate - LMP | Week + Day |
| **Clinical EDC** | Clinical Estimated Data of Confinement<br>Clinical EDC = LMP + 280 Days | Date transferred from the Patient Data form or selected from the drop-down calendar |

| Field | Description | Selections |
|---|---|---|
| **Measurement** | Displays the selected reference author and estimated menstrual age based on measured results for:<br>BPD<br>GS<br>CRL<br>Displays measured results for:<br>FHR | --- |
| **Uterus imaged transversely** | Check box to indicate the orientation of the image of the uterus. | --- |
| **Uterus imaged longitudinally** | Check box to indicate the orientation of the image of the uterus. | --- |
| **Intrauterine gestational sac present** | Check box to indicate the presence of the intrauterine gestational sac. | --- |
| **Yolk sac present** | Check box to indicate the presence of the yolk sac. | --- |
| **Fetal pole present** | Check box to indicate the presence of the fetal pole. | --- |
| **Cardiac flicker present** | Check box to indicate the presence of cardiac flicker. | --- |
| **Fetal motion present** | Check box to indicate the presence of fetal motion. | --- |
| **Interpretation** | Interpretation | **Intrauterine pregnancy**<br>**Live intrauterine pregnancy**<br>**No definitive uterine pregnancy** |
| **Fluid in cul-de-sac** | Fluid in cul-de-sac | **None**<br>**Physiologic**<br>**Small**<br>**Moderate**<br>**Large** |

# Cardiac Data

## Description of Unique Report Fields

**Note:** If a measurement has been completed or the Description has been edited, the system inserts an asterisk mark (*).

| Field | Description | Selections |
|---|---|---|
| **Subcostal view** | Check box to indicate the orientation of the image. | --- |
| **Parasternal view** | Check box to indicate the orientation of the image. | --- |
| **Apical view** | Check box to indicate the orientation of the image. | --- |
| **Pericardial effusion** | Pericardial effusion | **None** |
| | | **Physiologic fluid/ epicardial fat** |
| | | **Small effusion** |
| | | **Moderate effusion** |
| | | **Large effusion** |
| **LV Function** | Left ventricular function | **Good(EF > 50%)** |
| | | **Moderate(EF 30-50%)** |
| | | **Poor(EF < 30%)** |
| **EF** | Ejection Fraction | Calculation results based on EDV and ESV measurements |

# Bladder

## Description of Unique Report Fields

**Note:** If a measurement has been completed, the system inserts an asterisk mark (*).

| Field | Description | Selections |
|---|---|---|
| **Imaged transversely** | Check box to indicate the orientation of image. | --- |
| **Depth** | Measured results | --- |
| **Width** | Measured results | --- |
| **Imaged sagitally** | Check box to indicate the orientation of image. | --- |
| **Depth** | Measured results | --- |
| **Length** | Measured results | --- |
| **Volume** | Calculated results based on transverse and/or sagittal plane measurements and the labeled measurements used to calculate the volume. | **Trans D** (Transverse Depth)<br>**Trans W** (Transverse Width)<br>**Sag D** (Sagittal Depth)<br>**Sag L** (Sagittal Length) |

# DVT (Deep Vein Thrombosis)

## Description of Unique Report Fields

| Field | Description | Selections |
|---|---|---|
| **Leg imaged** | Leg Imaged | **Right**<br>**Left** |
| **CFV** | Common Femoral Vein | **Compressible**<br>**Non-compressible**<br>**Not imaged** |
| **SFV** | Superficial Femoral Veins | **Compressible**<br>**Non-compressible**<br>**Not imaged** |
| **Pop. V** | Popliteal Vein | **Compressible**<br>**Non-compressible**<br>**Not visualized** |

# Viewing and Using the Report

## Accessing the Report and Report Sections (Tabs)

**To access the Report:**

1. During an **EM** exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** in the Measurement Menu and then press the **SET** key.

   The system displays the first tab of the Report.

2. To access a different report tab, roll the trackball to position the pointer on the name of the tab and then press the **SET** key.
3. To redisplay the image screen, press the **ESCAPE** key or roll the trackball to position the pointer on **Return** at the bottom of the report and then press the **SET** key.

## Selecting a Check box

**To select a check box:**

1. Access the patient report.
2. Roll the trackball to position the pointer on a check box and then press the **SET** key.

# Inserting Comments

**To add comments to a report:**

1. Access the patient report.
2. Roll the trackball to position the pointer in the **Comments** field and then press the **SET** key.

   **Note:** When adding new comments to existing comments, roll the trackball to position the pointer at the end of the existing text in the **Comments** field and then press the **SET** key.
3. Use the keyboard to add new comments or edit the existing comments.

   **Note:** Enter your comments as a single paragraph. Do not use the **Enter** key on the keyboard to separate lines of comments.

**F6**

M&R
▶Measurement and Report Preset
▶▶Comments Library for Report

**To create comments for the patient report using the system presets:**

1. Access the Comments Library for Report screen.
2. Roll the trackball to position the pointer in one of the five text boxes and then press the **SET** key.
3. Type the comment text and then press the **SET** key.

   **Note:** Enter your comments as a single paragraph. Do not use the **Enter** key on the keyboard to separate lines of comments.
4. Repeat steps 2 and 3 as required to create comments for the report. You can also edit or add to existing comments.
5. When you are finished, roll the trackball to position the pointer on **OK** and then press the **SET** key.

**To add comments from the system presets to a report:**

1. Roll the trackball to position the pointer on **Comments**, and then press the **SET** key.

   The system displays the list of comments from the presets in the Comments Dialog.

2. Roll the trackball to highlight the comment and then press the **SET** key.
3. Roll the trackball to position the pointer on **OK** and then press the **SET** key.

   The system places the selected text in the **Comments** field.

4. Repeat steps 2 and 3 as required to annotate the report.

   **Note:** When adding new comments to existing comments, roll the trackball to position the pointer at the end of the existing text in the **Comments** field and then press the **SET** key.

**System Reference**

Documentation Devices Ch 4

# Printing the Report

**To print the patient report:**

Use the system presets to specify a destination device and format for the Report.

**F6**

System Configuration
▶Peripheral
▶Customize Keys
▶Storage

1. Roll the trackball to position the pointer on **Send Report** at the bottom of the report screen and then press the **SET** key.

   The system transfers the patient report to the destination device.

2. If the system is configured for more than one destination device, then select the output destination in the dialog box, and press the **SET** key.

# B4 Urology and Rectal Measurements and Calculations

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# Urology and Rectal Measurements and Calculations

All general measurements and calculations in 2D-mode and M-mode are available for use with the Urology or Rectal[1] exam. Each exam has specific 2D-mode labels and a patient report.

**[2] Instructions for Use**

General Measurements Ch B1
Measurement Menu Ch B1

## Measurement Menu

During a Urology or Rectal exam, activating the measurement function causes the system to display a Measurement Menu on the left side of the image screen. The Measurement Menu contains system-defined measurement and calculation labels.

[1] Requires software version 2.0 or higher

# Urology ▪ 2D-Mode Measurement Labels

The system-defined measurement labels display in the Measured Results when the Urology exam is selected and in the Urology patient report with the measured result, when assigned.

| Measurement Label | Description | Measurement Method Options |
|---|---|---|
| **U.Blad** | Urinary bladder | n/a |
| **Pre V** | Pre-void Volume | 2PI LxDxW Volume |
| **Post V** | Post-void Volume | 2PI LxDxW Volume |
| **(Mic V)** | Micturated Volume | (calculated) |
| **Prostate-V1** | Prostate Volume | 2PI LxDxW Volume |
| **Volume** | | |
| **Length** | | Distance |
| **Depth** | | Distance |
| **Width** | | Distance |
| **Prostate-V2** | Prostate Volume | 2PI LxDxW Volume |
| **Volume** | | |
| **Length** | | Distance |
| **Depth** | | Distance |
| **Width** | | Distance |

# Urology ▪ 2D-Mode Calculation Label

The 2D-mode calculation label for use with the Urology exam, PSAD, does not display in the Measurement Menu. Instead, the system automatically performs a calculation if you enter a PSA value in the Urology patient report and complete a volume measurement of the prostate.

| Calculation Label | Description | Required Measurements |
|---|---|---|
| **PSAD** | Prostate Specific Antigen Density — Index determined by the PSA value divided by the prostate volume calculation. | A Volume (V) measurement of the Prostate and the PSA value entered using the keyboard in the Urology patient report. |

# Rectal ▪ 2D-Mode Measurement Labels

The system-defined measurement labels display in the Measured Results when the Rectal exam is selected and in the Rectal patient report with the measured result, when assigned.

| Measurement Label | Description | Measurement Method Options |
|---|---|---|
| **Endrec-V1** | Endorectal Volume | 2Pl LxDxW Volume |
| **Volume** | | |
| **Width** | | Distance |
| **Depth** | | Distance |
| **Length** | | Distance |
| **Endrec-V2** | Endorectal Volume | 2Pl LxDxW Volume |
| **Volume** | | |
| **Width** | | Distance |
| **Depth** | | Distance |
| **Length** | | Distance |

# Stepwise Volume

(Requires software version 2.0 or higher)

**Note:** Use the system presets to add the **Step Vol** measurement to the 2D-mode Measurement menu for the **Rectal** or **Urology** exam type.

Stepwise Volume is a real-time measurement and is available only when the Endo-P II transducer is selected. The diameter for the structure of interest is measured in the transverse plane using a Distance measurement method, and the value obtained is displayed as a length. A Trace measurement is then performed on each section of the structure of interest, in the longitudinal plane, and the system accumulates the calculated areas to determine the volume for the structure.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶ Measurement and Report Preset
▶▶ Customize General Measurement Menu

**[2] Instructions for Use**

Endo-P II Transducer Ch C3
Biopsy (Puncture) Function Ch A4

### To measure Stepwise Volume:

1. Activate the Measurement function without freezing the image.
2. Roll the trackball into the Measurement menu to highlight **Step Vol** and then press the **SET** key on the control panel.

   The system displays a dialog box listing available settings for the number of sections.
3. To change the number of sections to be traced, use the trackball and **SET** key to select the up or down arrow to the right of the displayed setting until the required setting is displayed.

   **Note:** Available selections are 3 to 9, in increments of 1.
4. To save the number of sections and exit the dialog box, use the trackball and **SET** key to select the **OK** button on the dialog box.

   The system displays the first measurement marker in the image.
5. Roll the trackball to position the first measurement marker in the transverse plane and then press the **SET** key.

   The system displays the second measurement marker on the image.

6. Roll the trackball to position the second measurement marker to define the length and then press the **SET** key.

   The transducer changes to the longitudinal plane.

7. Roll the trackball to position the first measurement marker for the trace and then press the **SET** key.

   The system anchors the first marker and displays a second measurement marker over the first marker.

8. Roll the trackball to outline the structure of interest and then press the the **SET** key to close the trace..

   The system displays the area (**A**) and circumference (**C**) values for that section in Measured Results, and then displays a measurement marker in the next section.

9. Repeat steps 7 and 8 for each section.

   The system displays the area (**A**) and circumference (**C**) values for each section as the trace is completed. When all sections are measured, the system displays the calculated volume for the structure of interest in Measured Results.

10. To transfer the measured result to the patient report, you must assign the result to a **Volume** label.

    a. Roll the trackball to highlight the menu category at the top of the Measurement Menu and then press the **SET** key.

       The system displays the list of menu categories, such as **Rectal (2D)**, **Urology (2D)** and **Other**.

    b. Roll the trackball to select **Rectal (2D)** or **Urology (2D)** and then press the **SET** key.

    c. Roll the trackball to select the **Volume** label and then press the **SET** key.

       The system transfers the measured volume to the patient report.

# Incremental Volume

(Requires software version 2.0 or higher)

**Note:** Use the system presets to add the **Incr Vol** measurement to the 2D-mode Measurement menu for the Rectal exam type.

**System Reference**

System Presets Ch 3

The Incremental Volume measurement is specifically for use with the Endo-P II transducer during a Rectal exam type in combination with a separately purchased stepper device.

The system calculates a volume of the prostate based on a series of sequential area measurements. Area measurements are obtained by tracing several outlines of the prostate in progressive planes. The outlines are traced in increments. These increments are determined by the ***stepsize***.

$$\sum 1/3 \left( PA(i) + PA(I\text{-}1) + \sqrt{(PA(i) \times PA(i\text{-}1))} \right) \times Stepsize$$

Use the system presets to modify the stepsize.

**F6**

M&R
▶ Measurement and Report Preset
▶▶ Customize General Measurement Menu
M&R
▶ Urology Stepsize

## To measure Incremental Volume:

**Note:** This measurement method is specifically for use with the Endo-P II transducer in the transverse plane. The transducer is used with a stepper device. Activate the Biopsy function and ensure the **Tpl** guidelines are displayed before beginning this procedure. To display the **Tpl** guidelines, select the **Tpl** option from **Type** on the **Biopsy** menu.

**[2] Instructions for Use**

Endo-P II Transducer Ch C3
Biopsy (Puncture) Function Ch A4

**Note:** If **ESCAPE** is pressed at any time during this process, the measurement will end.

1. Activate the Measurement function.
2. Roll the trackball to highlight **Incr Vol** in the Measurement menu and then press the **SET** key on the control panel.

   The system displays the first measurement marker in the image and the stepsize indicated by **Step** in the Measured Results.
3. Roll the trackball to position the first measurement marker and then press the **SET** key.
4. Roll the trackball to outline the structure of interest and then press the the **SET** key to close the trace.

   The system displays values for the area, circumference, and the calculated volume in Measured Results.
5. Move (step) the transducer according to the stepsize in the Measurement menu.

6. Press the **FREEZE** key on the control panel, acquire an image, then press the **CALIPER** key on the control panel for the next measurement.

   The system highlights **Incr Vol** in the Measurement menu to indicate that the measurement is being continued.

7. Repeat steps 3 through 6 until the last outline is complete.

   The system updates the cumulative total of all volumes.

8. To transfer the measured result to the patient report, you must assign the result to a **Volume** label.

   a. Roll the trackball to highlight the menu category at the top of the Measurement Menu and then press the **SET** key.

      The system displays the list of menu categories, such as **Rectal (2D)**, **Urology (2D)** and **Other**.

   b. Roll the trackball to select **Rectal (2D)** and then press the **SET** key.

   c. Roll the trackball to select the **Volume** label and then press the **SET** key.

      The system transfers the measured volume to the patient report.

# Urology and Rectal Patient Reports



The Urology exam and Rectal exam each have a patient report. The report includes data from the patient data form, measured values obtained during the exam that have been assigned to a label, and descriptive data and text entered by the user.

You can use the Report Drawing function to indicate a specific structure of interest in the patient report.

**To access the Urology report:**

1. During a Urology exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** in the Measurement Menu and then press the **SET** key.

   The system displays the Urology patient report.

2. To redisplay the image screen, press the **ESCAPE** key or roll the trackball to **Return** at the bottom of the report and then press the **SET** key.

**To access the Rectal report:**

(Requires software version 2.0 or higher)

1. During a Rectal exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** in the Measurement Menu and then press the **SET** key.

   The system displays the Rectal patient report.

2. To redisplay the image screen, press the **ESCAPE** key or roll the trackball to **Return** at the bottom of the report and then press the **SET** key.

**To use a drop-down box:**

**Prerequisite:** Access the report before beginning this procedure.

1. Roll the trackball to position the pointer in the drop-down box and then press the **SET** key.
2. Roll the trackball to highlight the selection and then press the **SET** key.

**To use a text entry field:**

**Prerequisite:** Access the report before beginning this procedure.

1. Roll the trackball to the text entry field and then press the **SET** key.
2. Use the keyboard to enter data.

# Annotating a Report

There are two methods for entering text into the **Comments** section of a patient report. You can enter text from the keyboard or insert comments that you have pre-defined in the system presets. You can edit comments after placing them in the report.

**Note:** If the report has more than one page, you must access the page containing the **Comments** field before the system will display the comments.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset
▶▶ Comments Library for Report\ Customize Keys

### To enter text:

1. When a patient report is displayed, roll the trackball to place the text cursor at the required position in the **Comments** field of the report.
2. Enter text using the keyboard.

**Note:** Enter your comments as a single paragraph. Do not use the **Enter** key on the keyboard to separate lines of comments.

### To insert pre-defined comments:

**Note:** Use the system presets to pre-define comments for each exam type.

1. When a patient report is displayed, roll the trackball to the **Comments** button and then press the **SET** key.

   A list of available phrases displays on the screen.

2. Roll the trackball to highlight a phrase and then press the **SET** key.

   The system places the phrase in the **Comments** field of the report.

   **Note:** When adding new comments to existing comments, roll the trackball to position the pointer at the end of the existing text in the **Comments** field and then press the **SET** key.

3. Continue entering phrases. When finished, press the **ESCAPE** key on the control panel to exit.

   The system removes the list of phrases from the screen.

## Urology Report ▪ Descriptive Data

The Urology patient report contains drop-down boxes with descriptive data for the following information:

- Digital Rectal Exam (DRE) Malignancy Suspicion
- Trans Rectal Ultrasound System (TRUS) Prostate
- Trans Rectal Ultrasound System Seminal Vesicles

| Report Item | Selections |
|---|---|
| DRE Malignancy Suspicion | No<br>Yes<br>Right<br>Left<br>No/-Base<br>Yes/-Base<br>Right/-Base<br>Left/-Base<br>No/-Apex<br>Yes/-Apex<br>Right/-Apex<br>Left/-Apex<br>No/-Mid<br>Yes/-Mid<br>Right/-Mid<br>Left/-Mid |
| TRUS Prostate Echogenicity | (Blank)<br>Normal<br>Hyperechoic<br>Isoechoic<br>Hypoechoic<br>Diffuse |
| TRUS Prostate Margin | (Blank)<br>Intact<br>Disrupted<br>Intact/-Right<br>Disrupted/-Right<br>Intact/-Left<br>Disrupted/-Left<br>Intact/-Apex<br>Disrupted/-Apex<br>Intact/-Mid<br>Disrupted/-Mid<br>Intact/-Base<br>Disrupted/-Base |

| Report Item | Selections |
|---|---|
| TRUS Prostate Size | (Blank)<br>Normal<br>Enlarged<br>Atrophic<br>Hypertrophic |
| TRUS Prostate Symmetry | (Blank)<br>Yes<br>No<br>L>R<br>R>L |
| TRUS Seminal Vesicle Symmetry | (Blank)<br>Yes<br>No<br>L>R<br>R>L |
| TRUS Seminal Vesicle Size | (Blank)<br>Normal<br>Enlarged<br>Atrophic<br>Hypertrophic |

## Rectal Report ▪ Descriptive Data

(Requires software version 2.0 or higher)

The Rectal patient report contains drop-down boxes with descriptive data.

| Report Item | Selections |
|---|---|
| **Lymph Node** | **None Seen**<br>**Yes**<br>**Multiple** |
| **Echogenicity** | (Blank)<br>**Hyperechoic**<br>**Isoechoic**<br>**Hypoechoic**<br>**Diffuse** |
| **[Rectal]** | |
| **Wall** | (Blank)<br>**Intact**<br>**Disrupted**<br>**Not Seen** |
| **Tumor** | **None Seen**<br>**Yes**<br>**Multiple** |
| **Echogenicity** | (Blank)<br>**Hyperechoic**<br>**Isoechoic**<br>**Hypoechoic**<br>**Diffuse** |

# Report Drawing Function

Use the Report Drawing function to indicate structures of interest on the pictograms in the Urology patient report or the Rectal patient report.

**To indicate a structure of interest in the displayed report:**

1. Roll the trackball to the **Draw** button on the report and then press the **SET** key on the control panel.

   A square cursor displays in the middle of the pictogram on the report.

2. Roll the trackball to place the cursor where you want to begin tracing and then press the **SET** key.
3. Roll the trackball to create a trace. Undo the trace prior to completion by pressing the **SELECT** control on the control panel. Each press of this control deletes the next most recent dot. Resume tracing by rolling the trackball at any time. If necessary, press the **ESCAPE** key on the control panel to delete the entire trace prior to completion.
4. When you have completed the drawing, press the **SET** key.

   The system joins beginning and ending cursor positions and marks the area created by the trace.

5. Repeat steps 1 through 4 for each structure of interest.

**To remove a trace drawing from the displayed report:**

1. Roll the trackball to the **Delete** button and then press the **SET** key.

   The system displays a marker in the middle of the pictogram.

2. Roll the trackball to position the marker on the trace drawing and then press the **SET** key.

   The system deletes the trace drawing.

3. Repeat steps 1 and 2 as required for each trace drawing.

# References


### Prostate Volume

Rifkin, Matthew D., M.D. "Prostate and Seminal Vesicle Measurements." Chapter 16 in *Atlas of Ultrasound Measurements*. B. B. Goldburg and A. B. Kurtz. Chicago: Year Book Medical Publishers, 1990.

Littrup, Peter J., M.D., et al. "Determination of Prostate Volume with Transrectal US for Cancer Screening." *Radiology 1991*; 178:536-542, 179:49-53.

### Prostate Specific Antigen Density

Benson, M. C., et al. "The Use of Prostate Specific Antigen Density to Enhance the Predictive Value of Intermediate Levels of Serum Prostate Specific Antigen." *Journal of Urology*, 147: 817, 1992.

# B5 Cardiac Measurements and Calculations


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# Cardiac Measurements and Calculations

⚠ **WARNING:** Do not use the Cardiac Measurements and Calculations package unless you are thoroughly trained in echocardiography and thoroughly familiar with the safe operation of the ultrasound system.

Imaging the heart necessitates a unique methodology for precision measurements and calculation of equations. For this reason, the Cardiac exam provides measurements and methods for 2D-mode and M-mode that are selected from onscreen menus. Menu selections vary with the selected measurement type and mode. Calculated results display in the Measured Results section of the screen and, along with labeled measurements, are transferred to the Cardiac worksheet and patient report.

# Customizing Cardiac Measurements and Reports

Use the system presets to customize the Cardiac exam type.

**System Reference**

System Presets Ch 3

### Options for Exam Configuration Default Settings

- Select the system response when the **FREEZE** key is pressed, display CINE or activate the measurement function.
- Create or edit the Pictogram List.
- Create or edit the Text Annotation List.

### Options for Measurements and Reports (M & R)

- Specify the shape, size, and default position for the caliper.
- Specify whether the background for the Measured Results section of the screen has a different color than the image background.
- Select the default measurement method for each mode.
- Select the default method for each type of measurement.
- Select the measurement methods that display for each mode, and the order in which they display.
- For left-ventricle guided measurements, select a system-defined pattern of measurement labels to include all the measurements for diastole and systole, or exclude specific labels from the guided measurement.
- For non-guided measurements, specify which labels display in the Measurement Menu and the order in which they display.
- Customize display options such as measurement titles for each mode, the method used for data averaging and operator and referring physician information for the patient report.
- Define the Comments Library for the patient report.

# Activating the Measurement Function

After acquiring and freezing an image or sweep, activate the measurement function by pressing the **CALIPER** key.

Use the system presets to activate the measurement function when the **FREEZE** key is pressed. You can also customize the system to highlight the Measurement Menu or display a measurement marker in the image when you activate the measurement function.

The system displays a measurement marker on the image and a list of measurements in the Measurement Menu for assessing Cardiac function. Each imaging mode has a specific list of Cardiac measurement types and measurement labels.

**System Reference**

System Presets Ch 3

**F6**

Default Settings
▶Automatic Freeze Response
M&R
▶Caliper Default Position
▶Default Menu Category

## Image Screen Layout

The exam, transducer type, and Measurement Menu display on the left side of the image screen. Measured Results display at the bottom of the screen by default.

### On-Screen Calipers

Multiple caliper sets can display on an image or sweep at one time, depending on the measurement. Each marker is positioned by rolling the trackball and anchored in place by pressing the **SET** key.

### Averaging Measured Results

You can assign up to five values to each measurement label. The system transfers the values into the worksheet.

Use the system presets to select a method for data averaging, Direct or Average. If you select the Direct method, the last value assigned to a measurement label displays next to the measurement units in the worksheet and in the patient report.

If you select the Average method, the system performs an average of the values as each value is assigned to the label. The last measured value displays in the Measured Results; the calculated average displays next to the measurement units in the worksheet and in the patient report.

**F6**

M&R
▶Measurement and Report Preset
▶▶Display Item

# Cardiac ▪ Measurement Menu

The Cardiac exam has a Measurement Menu that displays on the left side of the image screen when the measurement function is active. The menu indicates which Cardiac measurement type is currently in use for the active imaging mode, and displays measurement labels for the measurement type.

Use the system presets to customize the list of measurement labels for a non-guided measurement type, or to select a pattern of labels for a guided measurement type.

**System Reference**

System Presets Ch 3

**F6**

M&R
►Measurement and Report Preset
►►Measurement Order

**To select a Cardiac measurement type:**

1. Activate the measurement function.
2. Roll the trackball to highlight the menu category at the top of the Measurement Menu.
3. Press the **SET** key.

   The system displays the list of menu categories. For the Cardiac exam, the menu categories are Cardiac measurement types and general measurements (by mode).
4. Roll the trackball to select a Cardiac measurement type and then press the **SET** key.

   The system displays a list of corresponding measurement labels in the Measurement Menu.

General (2D)
Simpson SP
Mod. Simpson
Single Plane

*Example list of 2D-mode measurement types for Cardiac.*

**Simpson SP**
**EDV**
**ESV**
**Report**
**Worksheet**

*Example list of 2D-mode measurement labels for the selected measurement type.*

# Guided Measurements

Guided Measurements are system-defined sequences of individual measurements. A list of the necessary measurements for a guided measurement displays in the Measurement Menu. Once you have started a guided measurement sequence, you must perform the measurements in the specified order.

The Cubed, Teichholz, and Gibson measurement types for 2D-mode and M-mode left ventricular function assessment use guided measurements for systole and diastole. For each measurement type, use the system presets to select a system-defined pattern of measurement labels to include all the measurements for diastole and systole, or exclude specific labels from the guided measurement.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset
▶▶Measurement Order

# Cardiac ▪ 2D-Mode Measurement Labels

System-defined measurement labels for the active Cardiac measurement type display in the Measurement Menu. When a measured result is assigned to a label, the label and value display in the worksheet and the patient report.

Use the system presets to customize the list of measurement labels for a non-guided measurement type, or to select a pattern of labels for a guided measurement type.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset
▶▶Measurement Order

| Measurement Menu Label | Description | Measurement Method |
|---|---|---|
| **Mitral Valve** | ***Mitral Valve Function*** | |
| **EPSS** | E Point to Septal Separation. The distance between the anterior leaflet and the ventricular septum at early diastole. | Distance |
| **MVA(trace)** | Mitral Valve Area | Trace |
| **HR** | Heart Rate | |
| **AV/LA** | ***Aortic Valve/Left Atrium*** | |
| **AV Area** | Aortic Valve Area | Trace |
| **RV diam** | Right Ventricular Diameter | Distance |
| **AO** | Aorta | Distance |
| **ACS** | Aortic Cusp Separation | Distance |
| **LA diam** | Left Atrial Diameter | Distance |
| **LV Dimensions** | ***Left Ventricular Dimensions*** | |
| **RVAWd** | Right Ventricular Anterior Wall at end-diastole | Distance |
| **RVDd** | Right Ventricular Dimension at end-diastole | Distance |
| **IVSd** | Interventricular Septal Dimension at end-diastole | Distance |
| **LVIDd** | Left Ventricular Internal Dimension at end-diastole | Distance |
| **LVPWd** | Left Ventricular Posterior Wall Dimension at end-diastole | Distance |
| **IVSs** | Interventricular Septal Dimension at end-systole | Distance |
| **LVIDs** | Left Ventricular Internal Dimension at end-systole | Distance |
| **LVPWs** | Left Ventricular Posterior Wall Dimension at end-systole | Distance |

| Measurement Menu Label | Description | Measurement Method |
|---|---|---|
| **Volume-specific** | ***Left Ventricular Volume*** | |
| **LVAd sax PM** | Left Ventricular Area at Papillary Muscle level at end-diastole in short axis view | Trace |
| **LVAd sax MV** | Left Ventricular Area at Mitral Valve level at end-diastole in short axis view | Trace |
| **LVLd apical** | Left Ventricular Length at end-diastole in apical view | Distance |
| **LVAs sax PM** | Left Ventricular Area at Papillary Muscle level at end-systole in short axis view | Trace |
| **LVAs sax MV** | Left Ventricular Area at Mitral Valve level at end-systole in short axis view | Trace |
| **LVLs apical** | Left Ventricular Length at end-systole in apical view | Distance |
| **LVAd apical** | Left Ventricular Long Axis Area at end-diastole in apical view | Trace |
| **LVAs apical** | Left Ventricular Long Axis Area at end-systole in apical view | Trace |

# Cardiac ▪ 2D-Mode Calculation Labels

The system performs 2D-mode calculations when you complete the required measurements and assigns calculation labels to the results. Calculated results display in the Measured Results section of the screen and are transferred to the Cardiac worksheet and patient report.

| Calculation Label | Description | Required Measurements | Units |
|---|---|---|---|
| **CI** | ***Cardiac Index*** is the cardiac output per square meter of body surface area (BSA):<br>CI = CO÷BSA.<br>For height in centimeters and weight in kilograms:<br>BSA=0.007184 x (Weight$^{0.425}$)x(Height$^{0.725}$)<br>For height in feet/inches and weight in pounds:<br>BSA=0.007184 x (Weight x 0.454)$^{0.425}$x(Height x 2.54)$^{0.725}$ | HR and BSA (BSA is determined by height and weight of patient; entered in the patient data form)<br>EDV<br>ESV | L/min/m$^2$ |
| **CO** | ***Cardiac Output*** is the effective volume of blood ejected from the left ventricle of the heart per unit of time:<br>CO = [(EDV – ESV) ÷ 1000](HR). | EDV<br>ESV<br>HR | L/min |
| **EDV** and **ESV** | Left Ventricular ***End-Diastolic Volume***<br>Left Ventricular ***End-Systolic Volume*** | Varies with the selected Volume method. | mL |
| **EF** | ***Ejection Fraction*** is the ratio of the stroke volume to the end-diastolic volume:<br>EF = 100[(EDV-ESV)÷EDV]. | EDV<br>ESV | % |
| **FS** | ***Fractional Shortening*** is the percentage of shortening of the Left Ventricular dimension.<br>FS = 100[(LVIDd - LVIDs) ÷ LVIDd]. | LVIDd<br>LVIDs | % |
| **SI** | ***Stroke Index*** is a measurement of stroke volume normalized to BSA:<br>SI = SV÷BSA. | SV<br>BSA | mL/m$^2$ |
| **SV** | ***Stroke Volume*** is the volume of blood ejected from a ventricle during one cardiac cycle or phase of ventricular systole:<br>SV = EDV-ESV. | EDV<br>ESV | mL |

# Cardiac ▪ 2D-Mode Measurements

When the system is in 2D-mode with the Cardiac exam selected, activating the measurement function causes the system to display the list of cardiac measurement types or 2D-mode–specific measurement methods.

## Making a 2D-Mode Distance Measurement

The distance measurement calculates the length of a straight line between two markers.

This procedure uses the CINE playback function so that both diastolic and systolic measurements can be made from one image acquisition.

Use the system presets to customize the system to activate CINE playback when you activate the measurement function.

**[2] Instructions for Use**

CINE Ch A3

**System Reference**

System Presets Ch 3

**F6**

Default Settings
▶Automatic Freeze Response

**To label then measure a distance:**

1. During a Cardiac exam, acquire and freeze a 2D-mode image.
2. Press the **CINE** key to activate CINE playback.
3. Roll the trackball through Frame Review to view an end systolic or end diastolic frame.
4. Activate the measurement function.
5. If a list of measurement labels does not display, then select the menu category at the top of the Measurement Menu, and select the measurement type from the available categories (on the right) for the Measurement Menu.

   The Measurement Menu displays measurement labels.
6. Roll the trackball to select a measurement label in the Measurement Menu that requires the Distance method, and then press the **SET** key.

   The system displays the measurement method at the top of the Measurement Menu, activates the measurement method, and places a measurement marker on the image. The system also displays measurement data in the Measured Results.
7. Roll the trackball to position the measurement marker and then press the **SET** key.

   The system anchors a measurement marker and displays another measurement marker.
8. Roll the trackball to position the next measurement marker and then press the **SET** key.

   The system displays the measurement label and corresponding value in the Measured Results, and assigns the value to the label in the worksheet and the patient report.

**To measure then label distance:**

1. During a Cardiac exam, acquire and freeze a 2D-mode image.
2. Press the **CINE** key to activate CINE playback.
3. Roll the trackball through Frame Review to view an end systolic or end diastolic frame.
4. Activate the measurement function.
5. If a list of measurement methods does not display, then select the menu category at the top of the Measurement Menu, and select the name of the list of measurement methods from the available categories (on the right) for the Measurement Menu. For this procedure, select **General (2D)**.
6. If necessary, press the **CALIPER** key or select a measurement method from the menu to place a measurement marker on the image.

   The system displays measurement data in the Measured Results.
7. Roll the trackball to position the measurement marker and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.
8. Roll the trackball to position the next measurement marker and then press the **SET** key.

   The system automatically updates the measurement data in the Measured Results.
9. To assign the measurement data to a label:

   a. Select the menu category at the top of the Measurement Menu, and then select the measurement type from the available categories (on the right) for the Measurement Menu.

   b. Select the measurement label from the Measurement Menu.

      The system displays the measurement label and corresponding value in the Measured Results, and assigns the value to the label in the worksheet and the patient report.

# Making a 2D-Mode Trace Measurement

Use the Trace measurement method to outline a structure such as the mitral valve, the aortic valve, or the left ventricular chamber. The system measures the circumference of the structure and then calculates the area.

**[2] Instructions for Use**

LV Volumes B5-15

**To make a trace measurement:**

1. During a Cardiac exam, acquire and freeze a 2D-mode image.
2. Activate the measurement function.

   The Measurement Menu displays measurement labels.
3. Roll the trackball to select a measurement label in the Measurement Menu that requires the Trace method, and then press the **SET** key.

   The system places a measurement marker on the image and displays measurement data for circumference (**C**) and area (**A**) in the Measured Results.
4. Roll the trackball to position the measurement marker and then press the **SET** key.

   The system anchors the marker.
5. Roll the trackball to create a trace of the structure. To delete (undo) a segment of the outline, rotate the **SELECT** control on the control panel counterclockwise.
6. To complete the trace, press the **SET** key.

   The system displays the measurement label and corresponding value in the Measured Results, and assigns the value to the label in the worksheet and the patient report.

# Cardiac ▪ 2D-Mode Left Ventricular Function Assessment

Analysis of the heart involves the assessment of the Left Ventricular (LV) function using 2D-mode measurements.

**[2] Instructions for Use**

Calculation Labels B5-9

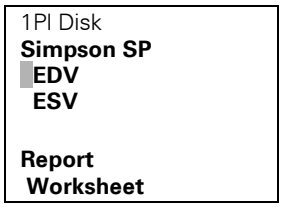
The system allows you to select from eight different volume formulas to calculate end-diastolic (**EDV**) and end-systolic volumes (**ESV**). The Modified Simpson, Single Plane, Bi-Plane, and Bullet formulas use distance and trace measurements. The Simpson Single Plane measurement type uses the 1Pl Disk volume measurement method. The Cubed, Teichholz, and Gibson formulas use guided measurements for ventricular distances.

| Volume Method | Menu Label | Description | Calculated Results |
|---|---|---|---|
| Simpson Single Plane | **Simpson SP** | Estimates Volume using the 1Pl Disk measurement at end-diastole and at end-systole for the apical two-chamber view. | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>SI $mL/m^2$<br>CI n/a |
| Modified Simpson Formula | **Mod. Simpson** | Estimates Volume using the trace measurement in two different views at end-diastole and at end-systole for sax MV and for sax PM. Also requires a distance measurement of the long axis dimension in an apical four-chamber view at end-diastole and at end-systole:<br>EDV (mL) = LVLd apical(mm)/9 * (4*LVAd sax MV($cm^2$) + 2*LVAd sax PM($cm^2$) + SQRT (LVAd sax MV($cm^2$) * LVAd sax PM($cm^2$)) /10)<br>ESV (mL) = LVLs apical(mm)/9 * (4*LVAs sax MV($cm^2$) + 2*LVAs sax PM($cm^2$) + SQRT (LVAs sax MV($cm^2$) * LVAs sax PM($cm^2$)) /10) | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>SI $mL/m^2$<br>CI n/a |
| Single Plane Formula | **Single Plane** | Estimates Volume using the trace measurement in a single plane at end-diastole and at end-systole for apical two- or four-chamber view.<br>Also requires a distance measurement of the long axis dimension in an apical view at end-diastole end-systole:<br>EDV = (8÷(3π)) * (LVAd apical($cm^2$))$^2$ / LVLd apical(mm) * 10<br>ESV = (8÷(3π)) * (LVAs apical($cm^2$))$^2$ / LVLs apical(mm) * 10 | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>SI $mL/m^2$<br>CI n/a |
| Bi-plane Formula | **Bi-Plane** | Estimates Volume using the trace measurement in two planes at end-diastole and at end-systole for apical and for sax MV.<br>Also requires a distance measurement of the LVIDd and the LVIDs:<br>EDV = (8÷(3π)) * LVAd apical($cm^2$) * LVAd sax MV($cm^2$) / LVIDd(mm) * 10<br>ESV = (8÷(3π)) * LVAs apical($cm^2$) * LVAs sax MV($cm^2$) / LVIDs(mm) * 10 | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>SI $mL/m^2$<br>CI n/a |

| Volume Method | Menu Label | Description | Calculated Results |
|---|---|---|---|
| Bullet Formula | **Bullet** | Estimates Volume using the trace measurement in one view at end-diastole and at end-systole for sax MV. Also requires a distance measurement of the long axis dimension in an apical view at end-diastole end-systole.<br>This formula assumes that the left ventricle is shaped like a bullet; the base being cylindrical and the apex cone-like:<br>EDV = (5÷6) * LVLd apical(mm) * LVAd sax MV($cm^2$) / 10<br>ESV = (5÷6) * LVLs apical(mm) * LVAs sax MV($cm^2$) / 10 | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>SI $mL/m^2$<br>CI n/a |
| Cubed Formula | **Cubed(2D)** | Estimates Volume from the Left Ventricular Internal Diameter (LVID) using the distance measurement:<br>EDV = LVIDd$(mm)^3$ / 1000<br>ESV = LVIDs$(mm)^3$ / 1000 | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>FS %<br>SI $mL/m^2$<br>CI n/a |
| Teichholz Formula | **Teichholz(2D)** | Estimates Volume from the Left Ventricular Internal Diameter (LVID) using the distance measurement:<br>EDV(mL) = 7*(LVIDd(mm) * LVIDd(mm) * LVIDd(mm) / 1000) / (2.4 + LVIDd(mm) / 10)<br>ESV(mL) = (7*LVIDs(mm) * LVIDs(mm) * LVIDs(mm) / 1000) / (2.4 + LVIDs(mm) / 10) | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>FS %<br>SI $mL/m^2$<br>CI n/a |
| Gibson Formula | **Gibson(2D)** | Estimates Volume from the Left Ventricular Internal Diameter (LVID) using the distance measurement:<br>EDV(mL)= π / 6*(0.98*LVIDd(mm) / 10 + 5.90) * LVIDd(mm) / 10 * LVIDd(mm) / 10<br>ESV(mL)= π / 6*(1.14*LVIDs(mm) / 10 + 4.18) * LVIDs(mm) / 10 * LVIDs(mm) / 10 | EDV mL<br>ESV mL<br>SV mL<br>CO L/min<br>EF %<br>FS %<br>SI $mL/m^2$<br>CI n/a |

# Determining a Left Ventricular End-Diastolic or End-Systolic Volume

When a volume measurement label is selected in the Measurement Menu, the default volume measurement method displays at the top, above the name of the measurement type. The Simpson Single Plane measurement type uses the 1PI Disk volume measurement method.




*Example list of 2D-mode measurement labels for a left ventricular volume measurement type.*

**To determine an EDV or ESV:**

1. During a Cardiac exam, acquire and freeze a 2D-mode image.
2. Press the **CINE** key to activate CINE playback.
3. Roll the trackball through Frame Review to view an end systolic or end diastolic frame.
4. Activate the measurement function.

   The Measurement Menu displays measurement labels.
5. Roll the trackball to select a volume measurement label in the Measurement Menu and then press the **SET** key.

   The system places a measurement marker on the image, activates the 1PI Disk volume measurement method, and displays the area (**A**), circumference (**C**), diameter (**D**), and volume (**V**) of the structure in the Measured Results.
6. Roll the trackball to position the measurement marker to begin the volume trace and then press the **SET** key.

   The system anchors the marker.
7. Roll the trackball to create a trace of the structure. To delete (undo) a segment of the outline, rotate the **SELECT** control counterclockwise.
8. To complete the trace, press the **SET** key.

   The system connects the beginning and end points of the trace and displays a line representing the long axis.
9. Roll the trackball to position the endpoint of the long axis and then press the **SET** key.

   The system displays the volume in the Measured Results and assigns the volume value to the measurement label.

# 2D-Mode Guided Measurements

The system provides guided measurements for the Cubed, Teichholz, and Gibson measurement types for left ventricular function assessment. Use the system presets to select one of the system-defined guided measurement sequences (patterns) of measurement labels for each measurement type.

This procedure describes the complete series of measurements. The measurements can also be performed individually, as non-guided measurements.

**System Reference**

System Presets Ch 3

**F6**

M&R
►Measurement and Report Preset
►►Measurement Order

**To make a guided LV function measurement:**

1. During a Cardiac exam, acquire and freeze a 2D-mode image.
2. Activate the measurement function.
3. Select the **Cubed(2D)**, **Teichholz(2D)**, or **Gibson(2D)** measurement type from the list in the Measurement Menu.

   The system displays the list of systole and diastole measurement labels in the Measurement Menu.
4. Roll the trackball to highlight **Diastole** in the Measurement Menu and then press the **SET** key.

   The system displays a measurement marker on the image and displays labels for the required measurements in the Measured Results. The measurement method, **LVDist**, displays at the top of the Measurement Menu.

Bullet
**Cubed(2D)**
Teichholz(2D)
Gibson(2D)

*Example list of 2D-Mode measurement types.*

5. Perform the measurements at end-diastole as follows:

   a. Roll the trackball to position the marker on the posterior right ventricular wall and then press the **SET** key.

      The system anchors the marker and displays the next measurement marker.

   b. Set the plane to complete the measurement string.

      The measurement data for the first distance measurement in the Measured Results updates as you roll the trackball.

   c. Roll the trackball to position the second marker on the anterior interventricular septum and then press the **SET** key.

      The system anchors the marker, sets the plane for the remaining measurements in diastole, and displays the first distance value in the Measured Results. The measurement data for the second distance measurement in the Measured Results updates as you roll the trackball.

   d. Roll the trackball to position the marker on the posterior interventricular septum and then press the **SET** key.

      The system anchors the marker and displays the second distance value in the Measured Results. The measurement data for the third distance measurement in the Measured Results updates as you roll the trackball.

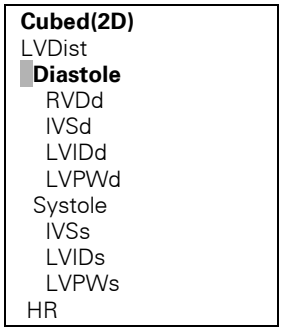
   e. Roll the trackball to position the marker on the endocardium of the left ventricular free wall and then press the **SET** key.

      The system anchors the marker and displays the third distance value in the Measured Results. The measurement data for the fourth distance measurement in the Measured Results updates as you roll the trackball.

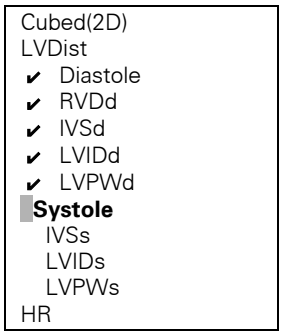
   f. Roll the trackball to position the marker on the posterior left ventricular free wall and then press the **SET** key.

      The system anchors the marker, displays the values for RVDd, IVSd, LVIDd, and LVPWd in the Measured Results, and assigns the values to the labels in the worksheet and the patient report. The system also displays the calculated value for EDV in the Measured Results.

      In the Measurement Menu, the system displays checkmarks next to the completed measurements and highlights **Systole** as the next suggested measurement.




*Example list of measurement labels for the 2D-Mode Cubed measurement type.*




*Example list of measurement labels for the 2D-Mode Cubed measurement type, after completing the diastole guided measurements.*

6. To perform systolic measurements, press the **SET** key.

   The system displays a measurement marker on the image and displays labels for the required measurements in the Measured Results.

7. Perform the measurements at end-systole as follows:

   a. Roll the trackball to position the marker on the anterior interventricular septum and then press the **SET** key.

      The system anchors the marker and displays the next measurement marker.

   b. Set the plane to complete the measurement string.

      The measurement data for the first distance measurement in the Measured Results updates as you roll the trackball.

   c. Roll the trackball to position the marker on the posterior interventricular septum and then press the **SET** key.

      The system anchors the marker, sets the plane for the remaining measurements in systole, and displays the first distance value in the Measured Results. The measurement data for the second distance measurement in the Measured Results updates as you roll the trackball.

   d. Roll the trackball to position the marker on the endocardium of the left ventricular free wall and then press the **SET** key.

      The system anchors the marker and displays the second distance value in the Measured Results. The measurement data for the third distance measurement in the Measured Results updates as you roll the trackball.

   e. Roll the trackball to position the marker on the posterior left ventricular free wall and then press the **SET** key.

      The system anchors the marker, displays the values for IVSs, LVIDs, and LVPWs in the Measured Results, and assigns the values to the labels in the worksheet and the patient report. The system also displays the calculated value for ESV, SV, EF, FS, and SI in the Measured Results.

### To make a non-guided LV function measurement:

**Note:** You can either select a measurement label and then perform the measurement, or perform the measurement and then assign the label to the measured results.

1. During a Cardiac exam, acquire and freeze a 2D-Mode image.
2. Activate the measurement function.
3. Select the **Cubed(2D)**, **Teichholz(2D)**, or **Gibson(2D)** measurement type from the list in the Measurement Menu.

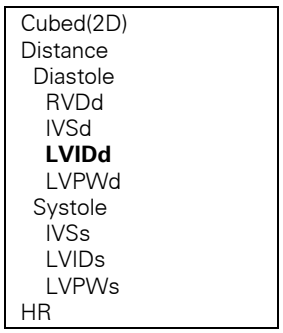
   The system displays the list of systolic and diastolic measurement labels in the Measurement Menu.
4. Roll the trackball to highlight any measurement label *except* **Diastole** or **Systole** in the Measurement Menu and then press the **SET** key.

   The system displays a measurement marker on the image and displays a distance (**D**) measurement in the Measured Results. The measurement method, **Distance**, displays at the top of the Measurement Menu.
5. Roll the trackball to position the measurement marker on the image and then press the **SET** key.

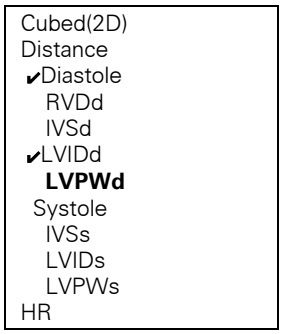
   The system anchors the marker and displays another measurement marker.
6. Roll the trackball to position the next measurement marker and then press the **SET** key.

   The system displays the distance value in the Measured Results and assigns the distance to the selected label.

   In the Measurement Menu, the system displays a checkmark next to the completed measurement and next to the **Diastole** or **Systole** series of measurements. The system also highlights the next measurement in the series.
7. Continue making measurements, as required. When all of the required measurements are made, the system calculates the **EDV** or **ESV** and displays the value in the Measured Results along with the values for SV, EF, FS, and SI.




*Example list of measurement labels for the 2D-Mode Cubed measurement type, performed as a non-guided measurement.*




*Example list of measurement labels after the first measurement.*

# Cardiac ▪ M-Mode Measurement Labels

System-defined measurement labels for the active Cardiac measurement type display in the Measurement Menu. When a measured result is assigned to a label, the label and value display in the worksheet and the patient report.

Use the system presets to customize the list of measurement labels for a non-guided measurement type, or to select a pattern of labels for a guided measurement type.

**System Reference**

System Presets Ch 3

**F6**

M&R
▶Measurement and Report Preset
▶▶Measurement Order

| Measurement Menu Label | Description | Measurement Method |
|---|---|---|
| **AV/LA** | ***Aortic Valve/Left Atrium function*** | |
| **AV Area** | Aortic Valve Area | Trace |
| **RV diam** | Right Ventricular Diameter | Distance |
| **AO** | Aorta | Distance |
| **ACS** | Aortic Cusp Separation | Distance |
| **LA diam** | Left Atrial Diameter | Distance |
| **LVET** | Left Ventricular Ejection Time | Time |
| **LVPEP** | Left Ventricular Pre-Ejection Period | Time |
| **Mitral Valve** | ***Mitral Valve function*** | |
| **CE amp** | Amplitude of the E wave | Distance |
| **CA amp** | Amplitude of the A wave | Distance |
| **DE excursion** | Anterior excursion of the mitral leaflet at early diastole. | Slope |
| **DE amp** | Amplitude of the DE wave | Distance |
| **EPSS** | E Point to Septal Separation. The distance between the anterior leaflet and the ventricular septum at early diastole. | Distance |
| **EF Slope** | Deceleration slope of the mitral leaflet's closure at early diastole | Slope |
| **LV Dimensions** | ***Left Ventricle Dimensions*** | |
| **RVDd** | Right ventricular dimension at end-diastole | Distance |
| **IVSd** | Interventricular septal dimension at end-diastole | Distance |
| **LVIDd** | Left ventricular internal dimension at end-diastole | Distance |
| **LVPWd** | Left ventricular posterior wall dimension at end-diastole | Distance |
| **IVSs** | Interventricular septal dimension at end-systole | Distance |
| **LVIDs** | Left ventricular internal dimension at end-systole | Distance |
| **LVPWs** | Left ventricular posterior wall dimension at end-systole | Distance |
| **LV Function** | ***Left Ventricle Function*** | |
| **LVET** | Left ventricular ejection time | Time |
| **LVPEP** | Left ventricular pre-ejection period | Time |

# Cardiac ▪ M-Mode Calculation Labels

The system performs M-mode calculations when you complete the required measurements. The resulting values display in the Measured Results and are automatically transferred to the patient report and the Worksheet.

| Calculation Label | Description | Required Measurements | Units |
|---|---|---|---|
| **CI** | ***Cardiac Index*** is the cardiac output per square meter of body surface area (BSA):<br>CI = CO÷BSA.<br>For height in centimeters and weight in kilograms:<br>BSA=0.007184 x (Weight$^{0.425}$)x(Height$^{0.725}$)<br>For height in feet/inches and weight in pounds:<br>BSA=0.007184 x (Weight x 0.454)$^{0.425}$x(Height x 2.54)$^{0.725}$ | BSA entry in the patient data form (determined by height and weight of patient) | L/min/m$^2$ |
| **CO** | ***Cardiac Output*** is the effective volume of blood ejected by either ventricle of the heart per unit of time:<br>CO = [(EDV - ESV)÷1000](HR). | EDV<br>ESV<br>HR | L/min |
| **CA/CE** | Ratio of the amplitudes of the A wave and the E wave:<br>CA/CE = CA amp(mm)/CE amp(mm) | CA amp<br>CE amp | Ratio or Index |
| **mVcf** | Mean velocity of left ventricular circumferential fiber shortening:<br>mVcf(circ/s) = (LVIDd(mm)-LVIDs(mm))/(LVIDd(mm)xLVET(ms)/1000) | LVIDd<br>LVIDs | circ/s |
| **LVSTI** | ***Left Ventricular Systolic Time Interval*** is the ratio of the pre-ejection period to the ejection time:<br>LVSTI = LVPEP(ms)/LVET(ms) | LVPEP<br>LVET | |
| **EDV** and **ESV** | Left Ventricular End-Systolic Volume and Left Ventricular End-Diastolic Volume estimate volume from the left ventricular internal diameter (LVID) using the distance measurement.<br>Cubed Volume Method:<br>EDV = LVIDd$^3$<br>ESV = LVIDs$^3$<br>Teichholz Volume Method:<br>EDV = 7(LVIDd$^3$ / 1000) / (2.4+LVIDd/10)<br>ESV = 7(LVIDs$^3$ / 1000) / (2.4+LVIDs/10)<br>Gibson Volume Method:<br>EDV = π / 6*(0.98*LVIDd/10+5.90) * LVIDd/10*LVIDd/10<br>ESV = π / 6*(1.14*LVIDs/10+4.18) * LVIDs/10*LVIDs/10 | LVIDd<br>LVIDs | mL |
| **EF** | ***Ejection Fraction*** is the ratio of the stroke volume to the end-diastolic volume:<br>EF = 100[(EDV-ESV)÷EDV]. | EDV<br>ESV | % |

| Calculation Label | Description | Required Measurements | Units |
|---|---|---|---|
| **AO/LA** | ***Aortic Ratio*** to ***Left Atrium:***<br>AO/LA = AO(mm)/LA diam(mm) | LA<br>AO | Ratio<br>or Index |
| **HR** | ***Heart Rate***:<br>HR = 60÷(R-R interval). | HR<br>a cardiac cycle | bpm |
| **SI** | ***Stroke Index*** is a measurement of stroke volume normalized to BSA:<br>SI = SV÷BSA. | SV<br>BSA | $mL/m^2$ |
| **SV** | ***Stroke Volume*** is the volume of blood ejected from a ventricle during one cardiac cycle:<br>SV = EDV-ESV. | EDV<br>ESV | mL |

# Cardiac ▪ M-Mode Measurement Methods

When the system is in M-mode with the Cardiac exam selected, activating the measurement function causes the system to display M-mode–specific measurement methods.

## Making an M-Mode Distance Measurement

The distance measurement calculates the length of a straight line between two vertical measurement markers.

**To label then measure distance:**

1. During a Cardiac exam, acquire and freeze an M-mode sweep.
2. Activate the measurement function.

   The Measurement Menu displays measurement labels.
3. Roll the trackball to select a measurement label in the Measurement Menu and then press the **SET** key.

   The system places a measurement marker on the image and displays measurement data in the Measured Results.
4. Roll the trackball to position the measurement marker and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.
5. Roll the trackball to position the next measurement marker and then press the **SET** key to complete the measurement.

   The system displays the distance value in the Measured Results and assigns the distance to the selected label.
6. Continue measurements, as required. The system accommodates up to five measurements for each label in the worksheet.

## Making a Heart Rate Measurement

This measurement method determines the heart rate by delineating one heart cycle with measurement markers that display as vertical lines.

**To determine a heart rate:**

1. During a Cardiac exam, acquire and freeze an M-mode sweep.
2. Activate the measurement function.

   The Measurement Menu displays measurement labels.
3. Roll the trackball to select the **HR** measurement label in the Measurement Menu and then press the **SET** key.

   The system places a measurement marker on the sweep and displays time (**T**) and heart rate (**HR**) values in the Measured Results.
4. Roll the trackball to position the measurement marker on the sweep at the beginning of the cardiac cycle and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.
5. Roll the trackball to position the next measurement marker at the end of the cardiac cycle and then press the **SET** key.

   The system displays the calculated heart rate in the Measured Results and transfers the value to the Worksheet and the Cardiology Report.

## Making a Time Measurement

The Time method measures the change in time between two points. Time is calculated on the horizontal axis. A measurement marker displays as a vertical line.

**To label then measure time:**

1. During a Cardiac exam, acquire and freeze an M-mode sweep.
2. Activate the measurement function.

   The Measurement Menu displays measurement labels.
3. Roll the trackball to select the **LVET** or **LVPEP** measurement label in the Measurement Menu and then press the **SET** key.

   The system places a measurement marker on the sweep and displays the time (**T**) value in the Measured Results.
4. Roll the trackball to position the measurement marker on the image and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.
5. Roll the trackball to position the next measurement marker and then press the **SET** key.

   The system displays the time value in the Measured Results and assigns the value to the selected label.

## Making a Slope Measurement

The Slope measurement measures the change in distance over time, as determined by two distance measurement markers.

**To measure then label a slope:**

1. During a Cardiac exam, acquire and freeze an M-mode sweep.
2. Activate the measurement function.

   The Measurement Menu displays measurement labels.
3. Select **Slope** from the measurement methods.

   The system places a measurement marker on the sweep and displays the slope (**S**) value in the Measured Results.
4. Roll the trackball to position the measurement marker on the sweep and then press the **SET** key.

   The system anchors the marker and displays the next measurement marker.
5. Roll the trackball to position the second marker then press the **SET** key.

   The system displays the slope value in the Measured Results.
6. To assign the measurement data to a label:

   a. Select the menu category at the top of the Measurement Menu, and then select the measurement type from the available categories (on the right) for the Measurement Menu.

   b. Select the measurement label from the Measurement Menu.

   The system displays the measurement label and corresponding value in the Measured Results, and assigns the value to the label in the worksheet and the patient report.

# Cardiac ▪ M-Mode Left Ventricular Function Assessment

The system provides guided measurements for the Cubed, Teichholz, and Gibson measurement types for left ventricular function assessment. Use the system presets to select one of the system-defined guided measurement sequences (patterns) of measurement labels for each measurement type.

These measurements can also be performed individually, as non-guided measurements.

**System Reference**

System Presets Ch 3

**F6**

M&R
►Measurement and Report Preset
►►Measurement Order

**To make a guided LV function measurement:**

1. During a Cardiac exam, acquire and freeze an M-mode sweep.
2. Activate the measurement function.
3. Select the **LV/Cubed(M)**, **LV/Teichholz(M)**, or **LV/Gibson(M)** measurement type from the list in the Measurement Menu.

   The system displays the list of systole and diastole measurement labels in the Measurement Menu.

   General(M)
   **LV/Cubed(M)**
   LV/Teichholz(M)
   LV/Gibson(M)

   *Example list of M-mode measurement types.*

4. Roll the trackball to highlight **Diastole** in the Measurement Menu and then press the **SET** key.

   The system displays a measurement marker on the sweep and displays labels for the required measurements in the Measured Results. The measurement method, LVDist, displays at the top of the Measurement Menu.

5. Perform the measurements at end-diastole as follows:

   a. Roll the trackball to position the marker on the posterior right ventricular wall and then press the **SET** key.

      The system anchors the marker and displays the next measurement marker. The measurement data for the first distance measurement in the Measured Results updates as you roll the trackball.

   b. Roll the trackball to position the second marker on the anterior interventricular septum and then press the **SET** key.

      The system anchors the marker and displays the first distance value in the Measured Results. The measurement data for the second distance measurement in the Measured Results updates as you roll the trackball.

   c. Roll the trackball to position the marker on the posterior interventricular septum and then press the **SET** key.

      The system anchors the marker and displays the second distance value in the Measured Results. The measurement data for the third distance measurement in the Measured Results updates as you roll the trackball.

   LV/Cubed(M)
   LVDist
   **Diastole**
   RVDd
   IVSd
   LVIDd
   LVPWd
   Systole
   IVSs
   LVIDs
   LVPWs
   LVET
   HR

   *Example list of measurement labels for the M-mode Cubed measurement type.*

d. Roll the trackball to position the marker on the endocardium of the left ventricular free wall and then press the **SET** key.

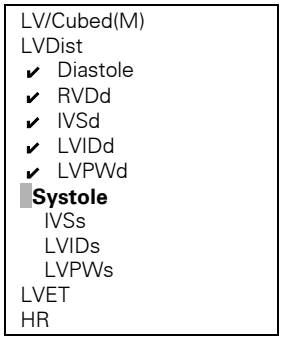
   The system anchors the marker and displays the third distance value in the Measured Results. The measurement data for the fourth distance measurement in the Measured Results updates as you roll the trackball.

e. Roll the trackball to position the marker on the posterior left ventricular free wall and then press the **SET** key.

   The system anchors the marker, displays the values for RVDd, IVSd, LVIDd, and LVPWd in the Measured Results, and assigns the values to the labels in the worksheet and the patient report. The system also displays the calculated value for EDV in the Measured Results. In the Measurement Menu, the system displays checkmarks next to the completed measurements and highlights **Systole** as the next suggested measurement.

6. To perform systolic measurements, press the **SET** key.

   The system displays a measurement marker on the sweep and displays labels for the required measurements in the Measured Results.




*Example list of measurement labels for the M-mode Cubed measurement type, after completing the diastole guided measurements.*

7. Perform the measurements at end-systole as follows:

   a. Roll the trackball to position the marker on the anterior interventricular septum and then press the **SET** key.

      The system anchors the marker and displays the next measurement marker. The measurement data for the first distance measurement in the Measured Results updates as you roll the trackball.

   b. Roll the trackball to position the marker on the posterior interventricular septum and then press the **SET** key.

      The system anchors the marker and displays the first distance value in the Measured Results. The measurement data for the second distance measurement in the Measured Results updates as you roll the trackball.

   c. Roll the trackball to position the marker on the endocardium of the left ventricular free wall and then press the **SET** key.

      The system anchors the marker and displays the second distance value in the Measured Results. The measurement data for the third distance measurement in the Measured Results updates as you roll the trackball.

   d. Roll the trackball to position the marker on the posterior left ventricular free wall and then press the **SET** key.

      The system anchors the marker, displays the values for IVSs, LVIDs, and LVPWs in the Measured Results, and assigns the values to the labels in the worksheet and the patient report. The system also displays the calculated value for ESV, SV, EF, FS, and SI in the Measured Results.

8. Roll the trackball to highlight LVET in the Measurement Menu and then press the **SET** key.

   The system displays a measurement marker on the sweep and displays a time (**T**) value in the Measured Results.

9. Roll the trackball to position the measurement marker on the image and then press the **SET** key.

   The system anchors the marker and displays another measurement marker.

10. Roll the trackball to position the next measurement marker and then press the **SET** key.

    The system displays the time value in the Measured Results and assigns the distance to the LVET label.

### To make a non-guided LV function measurement:

**Note:** You can either select a measurement label and then perform the measurement, or perform the measurement and then assign the label to the measured results.

1. During a Cardiac exam, acquire and freeze an M-mode sweep.
2. Activate the measurement function.
3. Select the **LV/Cubed(M)**, **LV/Teichholz(M)**, or **LV/Gibson(M)** measurement type from the list in the Measurement Menu.

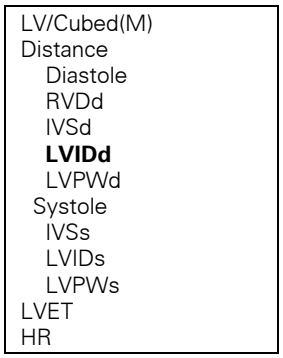
   The system displays the list of systole and diastole measurement labels in the Measurement Menu.
4. Roll the trackball to highlight any measurement label *except* **Diastole** or **Systole** in the Measurement Menu and then press the **SET** key.

   The system displays a measurement marker on the sweep and displays a distance (**D**) measurement in the Measured Results. The measurement method, Distance, displays at the top of the Measurement Menu.
5. Roll the trackball to position the measurement marker on the image and then press the **SET** key.

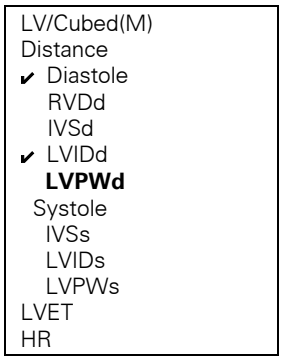
   The system anchors the marker and displays another measurement marker.
6. Roll the trackball to position the next measurement marker and then press the **SET** key.

   The system displays the distance value in the Measured Results and assigns the distance to the selected label.

   In the Measurement Menu, the system displays a checkmark next to the completed measurement and the set of measurements (Diastole or Systole) to which it belongs. The system also highlights the next suggested measurement.
7. Continue making measurements, as required. When all of the required measurements are made, the system calculates the EDV or ESV and displays the value in the Measured Results.




*Example list of measurement labels for the M-mode Cubed measurement type, performed as a non-guided measurement.*




*Example list of measurement labels after the first measurement.*

# Cardiology Patient Worksheets and Reports

The system transfers the labeled measurements and calculations from each Cardiac measurement type into the Cardiology Worksheets and the Cardiology Report. Information from the Patient Data form displays in the top two lines of the patient report.

Each Cardiac measurement type has a separate worksheet. Measurements can be edited only in the worksheet, and edited values are indicated in the worksheet and report with an asterisk ( * ).

## Using the Cardiology Worksheet

The measurements for a measurement type display in the same worksheet even if the measurements are taken in different imaging modes. For example, the AV/LA measurement type uses four distance measurements; if these measurements are made in 2D-mode, they still appear in the same worksheet as the two M-mode time measurements.

You can edit measurements directly in the worksheet. When you edit one of the measurements required for a calculation, the system updates the calculated value.

**To access a Cardiology Worksheet:**

1. During a Cardiac exam, roll the trackball to highlight **Worksheet** in the Measurement Menu during the measurement function.

   The system displays the Cardiology Worksheet.

2. To view a different page of the worksheet, roll the trackball to position the pointer on **Prev** or **Next** at the bottom of the page and then press the **SET** key.

3. To return to the image, roll the trackball to position the pointer on **Return** at the bottom of the page and then press the **SET** key.

**To move from the worksheet to the patient report:**

1. Display the Cardiology Worksheet.

2. Roll the trackball to position the pointer on **Report** at the bottom of the report screen, and then press the **SET** key.

   The system displays the page of the Cardiology Report for the current measurement type.

3. To access a report page for another measurement type, roll the trackball to position the pointer on the name of the measurement type and then press the **SET** key.

**To move from the patient report to the worksheet:**

1. Display the Cardiology Report.

2. Roll the trackball to position the pointer on the name of the measurement type and then press the **SET** key.

   The system displays the page of the Cardiology Report for the selected measurement type.

3. Roll the trackball to position the pointer on **Worksheet** at the bottom-right of the report screen, and then press the **SET** key.

   The system displays the worksheet for the selected measurement type.

# Editing Worksheets

Edit a worksheet to change the values that display in the patient report and the Measured Results. To change calculated results, edit the measurements that are components of the calculation.

The system displays an asterisk ( * ) next to an edited value. If an edited value is used in data averaging, an asterisk displays next to the calculated average.

**F6**

M&R
►Measurement and Report Preset
►►Display Item

**To edit a value in the worksheet:**

1. Display the worksheet.
2. Roll the trackball to position the pointer in the cell that you want to edit and then press the **SET** key.

   The system highlights the value.
3. Use the keyboard to edit the value and then press the **SET** key.

   The system displays an asterisk next to the value. If data averaging is used, the system also displays an asterisk next to the new average value.

   **Note:** If the value just edited is used in a calculation, the system displays an asterisk next to the newly-calculated value.

**To delete one value for a measurement:**

1. Roll the trackball to highlight a value in the worksheet and then press the **SET** key.
2. Roll the trackball to highlight **Delete Cell** at the bottom-right of the worksheet and then press the **SET** key.

   The system clears the selected cell in the worksheet. If data averaging is used, the system updates the averaged value based on the remaining measurements.

**To delete all values for a measurement:**

1. Roll the trackball to highlight a value in the worksheet and then press the **SET** key.
2. Roll the trackball to highlight **Delete Line** at the bottom-right of the worksheet and then press the **SET** key.

   The system displays a verification message.
3. Roll the trackball to **OK** and then press the **SET** key.

   The system removes all values for that measurement from the Worksheet.

   **Note:** If the value just deleted is used in a calculation, the system removes the calculated value from the worksheet and the Measured Results.

**To delete all values for a measurement type:**

1. Roll the trackball to highlight **Delete All** at the bottom-right of the worksheet and then press the **SET** key.

   The system displays a verification message.
2. Roll the trackball to position the pointer on **OK** and then press the **SET** key.

   The system removes all values for all measurements from the worksheet, and clears the page in the report for that measurement type.

## Using the Cardiology Report

The measurements for a measurement type display on the same report page even if the measurements are taken in different imaging modes.

**To access the Cardiology Report:**

1. During a Cardiac exam, press the **F2** key on the keyboard or roll the trackball to highlight **Report** in the Measurement Menu and then press the **SET** key.

   The system displays the first page of the Cardiology Report.

2. To access a different report page, roll the trackball to position the pointer on **Prev** or **Next** at the bottom of the report and then press the **SET** key.

3. To redisplay the image screen, press the **ESCAPE** key or roll the trackball to position the pointer on **Return** at the bottom of the report and then press the **SET** key.

**To add comments to a report:**

1. Access the patient report.
2. Roll the trackball to position the pointer in the **Comments** field and then press the **SET** key.

   **Note:** When adding new comments to existing comments, roll the trackball to position the pointer at the end of the existing text in the **Comments** field and then press the **SET** key.
3. Use the keyboard to add new comments or edit the existing comments.

   **Note:** Enter your comments as a single paragraph. Do not use the **Enter** key on the keyboard to separate lines of comments.

**To add comments from the system presets to a report:**

1. Roll the trackball to position the pointer on **Comments**, and then press the **SET** key.

   The system displays the list of comments from the presets in the Comments Dialog.
2. Roll the trackball to highlight the comment and then press the **SET** key.
3. Roll the trackball to position the pointer on **OK** and then press the **SET** key.

   The system places the selected text in the **Comments** field.
4. Repeat steps 2 and 3 as required to annotate the report.

   **Note:** When adding new comments to existing comments, roll the trackball to position the pointer at the end of the existing text in the **Comments** field and then press the **SET** key.

**System Reference**

Documentation Devices Ch 4

# C1 Transducer Accessories

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# Transducer Accessories

Attachment procedures for the following accessories are presented in this chapter or are shipped separately with the device. Accessories are arranged by transducer type in the following table:

**[1] Instructions for Use**

Cleaning and Care Ch 2

| Accessory | Curved Array | Linear Array | Mechanical Sector |
|---|---|---|---|
| Transducer Sheath | All | All | All |
| Gel Pad | | L10-5<br>7.5L75S | |
| Universal Needle Guide S | C4-2<br>C5-2<br>C8-5 | L10-5 | |
| 6.5EV13 Needle Guide Bracket Kit | EV9-4 | | |
| S-Array Needle Guide Bracket Kit | | 7.5L75S | |
| EC9-4 Disposable Needle Guide Kit | EC9-4 | | |
| EC9-4 Stainless Steel Needle Guide Kit | EC9-4 | | |
| Endo-V II Needle Guide Bracket Kit | | | Endo-V II |
| Endo-P II Needle Guide Bracket Kit | | | Endo-P II |

# Transducer Sheaths

**[2] Instructions for Use**

Endo-P II Ch C3

Siemens makes every effort to manufacture safe and effective transducers. You must take all necessary precautions to eliminate the possibility of exposing patients, operators, or third parties to hazardous or infectious materials. These precautions should be considered in the use of any application that may indicate the need for such care, and during endocavity or intraoperative scanning; during biopsy or puncture procedures; or when scanning patients with open wounds.

## General Information ▪ Sheaths

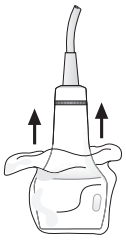
⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

⚠ **WARNING:** Only a sterile transducer sheath provides the sterile barrier required for surgical or puncture procedures. To ensure sterility of a procedure, always place a sterile sheath on a transducer as transducers cannot be sterilized using hot steam, cold gas, or Ethylene Oxide (ETO) methods.

Transducer sheaths are single-use items used to ensure proper acoustic coupling and provide a prophylactic barrier for the intended ultrasound application. Sheaths are available for all transducers. Siemens recommends the use of market-cleared transducer sheaths.

## Application ▪ Sheaths

Step-by-step instructions are provided for both non-sterile and sterile procedures.



**To place the transducer in a sheath for non-sterile use:**

Before applying any coupling agent (gel) to the sheath, remove any powder in the sheath by rinsing with water.

1. Remove the packaging and unfold the transducer sheath.
2. Apply a water-based coupling agent (gel) to the inside of the sheath and onto the face of the transducer.
3. Hold the transducer by the cable relief and unroll the sheath onto the transducer.
4. Pull the transducer sheath tightly over the face of the transducer to remove wrinkles.
5. Secure the sheath to the transducer housing or cable relief with the adhesive tapes or elastic bands provided.

**To place the transducer in a sheath for sterile use:**

Before applying any sterile coupling agent (gel) to the sheath, remove any powder in the sheath by rinsing with sterile water.

1. Using sterile technique, remove the packaging and unfold the transducer sheath.
2. Taking care not to contaminate the sheath, apply a sterile water-based coupling agent (gel) to the inside of the sheath and onto the face of the transducer.
3. Using sterile technique, hold the transducer by the cable relief and unroll the sheath onto the transducer and cable.
4. Pull the transducer sheath tightly over the face of the transducer to remove wrinkles.
5. Secure the sheath to the transducer cable with the adhesive tapes or elastic bands provided.

⚠ **WARNING:** After placing the sheath over the transducer, visually inspect the sheath to ensure there are no defects. Do not use the sheath if it has any holes or tears.

## Disposal ▪ Sheaths

While wearing protective gloves, remove the transducer sheath from the transducer and dispose of it according to medical regulations for biohazardous waste.

# Gel Pad

The gel pad is a disposable bacteriostatic standoff. It is used when superficial imaging requires an appropriate standoff for utilizing the focal zone of the transducer. The gel pad provides a fixed distance between the transducer face and the body surface.

**[2] Instructions for Use**

Compatible Transducers C1-3

⚠ **WARNING:** Ultrasound energy is transmitted more efficiently through the gel pad than through tissue. When using a standoff device of any kind, for example a waterpath or gel pad, the actual mechanical and thermal indices, MI and/or TI, may be higher than indicated in the output display on the system.

## Preparation for use

Before use, examine the gel pad for any material flaws. Any product showing flaws should not be used.

## Disposal ▪ Gel Pad

While wearing protective gloves, remove the gel pad from the transducer and dispose of it according to medical regulations for biohazardous waste.

# Needle Guide Brackets

**[2] Instructions for Use**

| | |
|---|---|
| Endo-V II | Ch C2 |
| Endo-P II | Ch C3 |

⚠ **WARNING:** Percutaneous procedures always involve heightened risk to the patient and to the operator handling biopsy needle guides. Clinicians using Siemens recommended biopsy devices under ultrasound guidance should be trained and must observe proper needle insertion sequencing with the needle guide in order to avoid undue discomfort and unnecessary risk and injury to the patient.

## EC9-4 Disposable Needle Guide Kit

Refer to the in-box instructions for attachment and care procedures.

## EC9-4 Stainless Steel Needle Guide Kit

Refer to the in-box instructions for attachment and care procedures, including cleaning and sterilization.

# Universal Needle Guide S

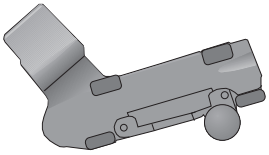
The Universal Needle Guide is a stainless steel transducer accessory used for biopsy and needle puncture procedures.

The Universal Needle Guide S consists of a needle bracket and three (3) needle caps. The needle caps are designed for quick release.

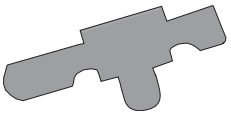
**[2] Instructions for Use**

Compatible Transducers C1-3

### Components of the Universal Needle Guide S



*needle bracket*



*needle cap*

The needle bracket and needle cap have a single angle. When the needle cap is attached to the bracket, a needle channel is created. This channel secures needles in the needle guide.

The needle caps are labeled with the needle size. Needle caps are provided for the following needle sizes:

- 0.9 mm (20 gauge)
- 1.2 mm (18 gauge)
- 1.8 mm (15 gauge)

**Note:** The Universal Needle Guide S supports *only* the needle sizes in the above list.

## Preparation for Use ▪ Universal Needle Guide S

**[2] Instructions for Use**

Needle Path Verification Ch A4

⚠ **WARNING:** Do not attempt to use the needle guide until you have read the following instructions. The needle guide should only be used after proper training and after verifying the path of the needle.

⚠ **WARNING:** The needle guide kit is packaged non-sterile. Sterilize these components prior to the first use.

**[1] Instructions for Use**

Cleaning and Care Ch 2
Sterilization Ch 2

⚠ **WARNING:** Ensure that the needle guide components are properly cleaned and sterilized before each use to avoid possible patient contamination.

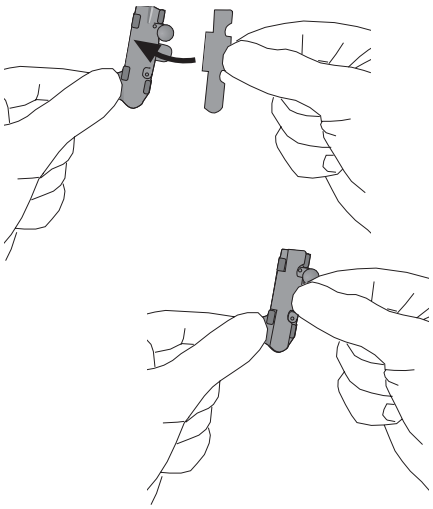
⚠ **WARNING:** Before attaching the needle guide to the transducer, place the transducer in a sterile transducer sheath.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

⚠ **Caution:** Use only a water-based ultrasound coupling agent (gel) with this kit. Petroleum- or mineral oil-based materials can harm the transducer.

**To attach the needle cap to the needle bracket:**

1. Place a sterile transducer sheath over the transducer.
2. Select the needle cap that matches the size of the needle to be used in the procedure. The needle size is marked on each needle cap.
3. Place the needle cap into the raised edge on the needle bracket, and then snap the needle cap onto the bracket. This secures the cap to the bracket and forms the needle channel.



*Attaching the needle cap to the needle bracket.*

**[2] Instructions for Use**

Transducer Sheaths C1-4

**To attach the needle guide to the transducer:**

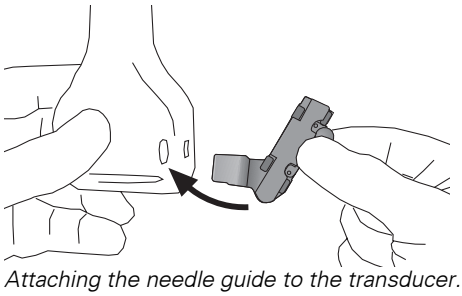
After the needle cap is attached to the needle bracket, attach the needle guide to the transducer.

**Using sterile technique:**

1. Loosen the thumb screw on the needle guide.

   Attach the needle guide to the grooves on the side of the transducer housing.

   **Note:** For illustration purposes only, the transducer is shown without a transducer sheath. Always place a sterile transducer sheath over the transducer.



*Attaching the needle guide to the transducer.*

2. Gently tighten the thumb screw to firmly secure the needle guide.

   ⚠ **Caution:** Excessive force could harm the transducer.

3. Insert the needle into the channel on the needle guide.

   The needle must be the correct size for the needle guide.

4. Before performing any patient procedure, verify the needle path.

**[2] Instructions for Use**

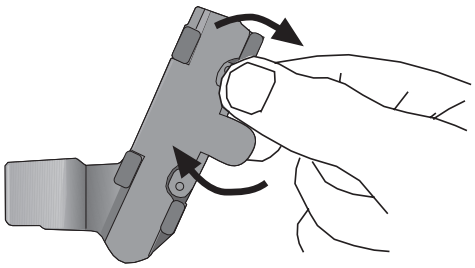
Needle Path Verification Ch A4

## Detachment Procedure ▪ Universal Needle Guide S

Before you remove the needle guide from the transducer, remove the needle cap from the needle bracket.

**To remove the needle cap from the needle bracket:**

1. Push down with the thumb and up with the index finger on the tabs to release the needle cap.
2. Pull the needle cap away from the bracket.



*Detaching the needle cap from the needle bracket.*

**To remove the needle guide from the transducer:**

1. Loosen the thumb screw on the needle guide.
2. Lift the needle guide up and away from the transducer.

# 6.5EV13 Needle Guide Bracket Kit (EV9-4)

The 6.5EV13 Needle Guide Bracket Kit consists of a needle guide and two cleaning brushes. You can use the needle guide with needle sizes ranging from 16 to 22 gauge (1.60 mm to 0.7 mm).

**[2] Instructions for Use**

Compatible Transducers C1-3

*Example of the 6.5EV13 Needle Guide.*

**Note:** The EV9-4 transducer has been designed to function properly with the 6.5EV13 Needle Guide Bracket Kit.

## Preparation for Use ▪ 6.5EV13 Needle Guide Bracket Kit

**[2] Instructions for Use**

Needle Path Verification Ch A4

⚠ **WARNING:** Do not attempt to use the Needle Guide Bracket Kit until you have read the following instructions. The needle guide should only be used after proper training and after verifying the path of the needle.

⚠ **WARNING:** The needle guide is packaged non-sterile. Sterilize this product prior to its first use.

⚠ **WARNING:** Ensure that the needle guide is properly cleaned and sterilized before each use to avoid possible patient contamination.

**[1] Instructions for Use**

Cleaning and Care Ch 2
Sterilization Ch 2

⚠ **WARNING:** Before attaching the needle guide to the transducer, place the transducer in a sterile transducer sheath.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

⚠ **Caution:** Use only a water-based ultrasound coupling agent (gel) with this kit. Petroleum- or mineral oil-based materials can harm the transducer.

### To attach the needle guide to the transducer:

**[2] Instructions for Use**

Transducer Sheaths C1-4

⚠ **WARNING:** Care must be taken to ensure that the needle guide is properly positioned. When properly positioned, the bracket will cover the colored ring on the transducer handle and the hook will be firmly against the transducer tip.

1. Place a sterile transducer sheath over the transducer.

   To ensure an accurate scan, there should not be any air bubbles or wrinkles between the transducer face and the transducer sheath.

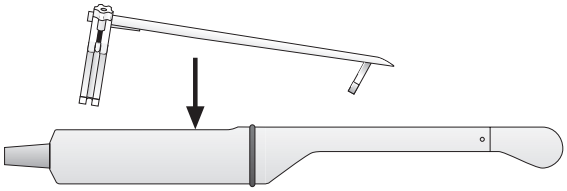
2. Loosen the thumb screw in the needle guide bracket.

1 Bracket
2 Thumb screw
3 Raised bar
4 Hook

3. Lift up the thumb screw to open the bracket.

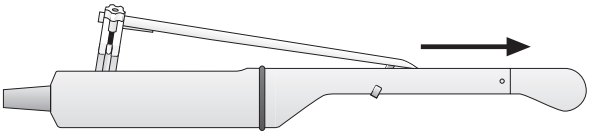
   Notice the raised bar on the inside of the bracket end of the needle guide. In step 4, this bar must fit in the notch on the colored ring on the transducer handle.

4. Place the hook over the middle of the transducer's shaft and then slide it up the length of the shaft.

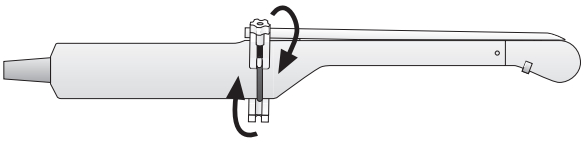


**Note:** For illustration purposes only, the transducer is shown without a transducer sheath. Always place a sterile transducer sheath over the transducer.

   When properly positioned, the bracket must cover the colored ring and the raised bar fits in the notch.



5. Close the bracket, reposition and tighten the thumb screw.



6. Before performing any patient procedure, verify the needle path.

**[2] Instructions for Use**

Needle Path Verification Ch A4

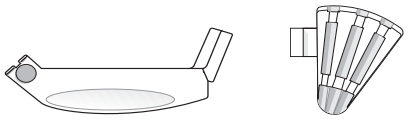
# S-Array Needle Guide Bracket Kits (7.5L75S)

The S-Array Needle Guide Bracket Kit is a transducer accessory used for biopsy and needle puncture procedures.

**[2] Instructions for Use**


Compatible Transducers C1-3
Universal Needle Guide S C1-8
Needle Path Verification Ch A4


### Components of the Needle Guide Kit



*Bracket* *Needle Guide Holder*

**[1] Instructions for Use**


Cleaning and Care Ch 2


The Needle Guide Bracket Kit consists of the bracket and five needle guide holders.

You must order both a Needle Guide Bracket Kit and a Needle Guide Set for use with your transducer. Needle guide sets contain three (3) pieces.

The needle guide supports the following needle sizes:

- 0.9 mm (20 gauge)
- 1.3 mm (18 gauge)
- 1.8 mm (16 gauge)
- 2.3 mm
- 2.5 mm

**Note:** The needle guide supports only the needle sizes shown in the above list.

*Example of a Needle Guide.*

## Preparation for Use ▪ S-Array Needle Guide

**[2] Instructions for Use**

Needle Path Verification Ch A4

⚠ **WARNING:** Do not attempt to use the Needle Guide Bracket Kit until you have read the following instructions. The needle guide should only be used after proper training and after verifying the path of the needle according to the needle path verification procedure.

⚠ **WARNING:** Needle Guide Bracket Kits are packaged as non-sterile. Sterilize these products prior to their first use.

⚠ **WARNING:** Ensure the components of the Needle Guide Bracket Kit are properly cleaned and sterilized before each use to avoid possible patient contamination.

⚠ **WARNING:** To ensure a proper fit, always use a polyethylene- or CIV-FLEX™-type transducer sheath with the S-Array Needle Guide Bracket Kit. Do not use a latex transducer sheath. CIV-FLEX™ sheaths can be ordered through Civco Medical Instruments Co., Inc., Kalona, Iowa, 1-800-445-6741.

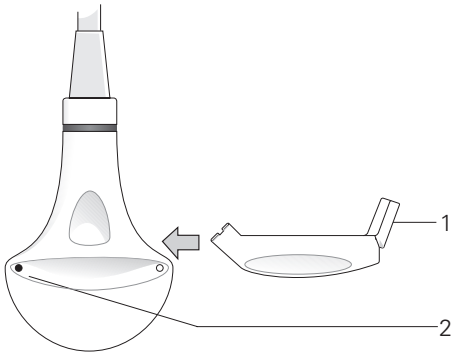
⚠ **WARNING:** The needle guide holder should fit securely against the needle guide bracket. Evaluate the fit of the needle guide holder and bracket prior to each use. After continued use, the fit of the needle guide holder to the bracket will deteriorate. Should this occur, replace the S-Array Needle Guide Bracket Kit.

⚠ **CAUTION:** Use only a water-based ultrasound coupling agent (gel) with this kit. Petroleum- or mineral oil-based materials can harm the transducer.

### To attach the bracket to the transducer:

1. Position the bracket on the transducer.

   When correctly positioned, the finger grooves on the bracket should fit into the indentation on the transducer, and the clasp should be on the side of the transducer with the raised colored dot.




1 Indicator of compatible transducer type
2 Colored dot

*Attaching the bracket to the transducer.*

2. Engage the clasp on the bracket to secure the bracket to the transducer.
3. Apply coupling agent (gel) to the face of the transducer.
4. Place a sterile polyethylene- or CIV-*FLEX*™-type transducer sheath over the transducer.

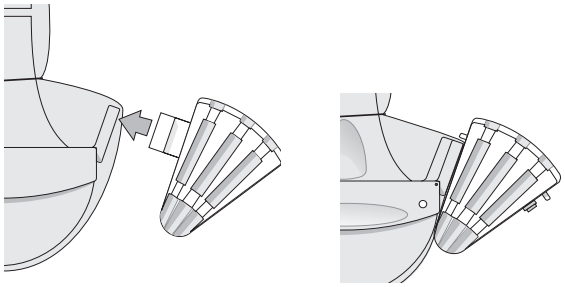
   To ensure an accurate scan, there should not be any air bubbles or wrinkles between the transducer face and the transducer sheath.

**[2] Instructions for Use**

Transducer Sheaths C1-4

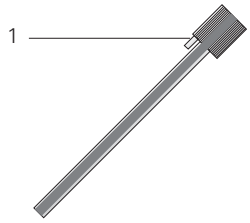
**To attach the needle guide holder to the bracket:**

1. Place the holder into the raised edge on the bracket and pivot the guide until it clicks into position. The needle guide holder should rest securely against the bracket.



*Attaching the holder to the bracket.*

2. Select the appropriate needle guide for the intended needle size to be used in the procedure.




1 Peg

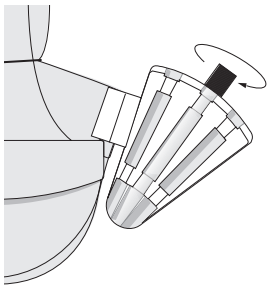
*Needle Guide.*

3. Insert the needle guide into the appropriate angle track.

   For curved array needle guide bracket kits, the three angle tracks are 25°, 35°, and 45°.

   For linear array needle guide bracket kits, the three angle tracks are 40°, 50°, and 60°.

4. Rotate the needle guide until the peg rests against the needle guide holder. When correctly installed, the needle channel should not be exposed.



*Securing the needle guide against the holder.*

5. Insert the needle into one of the three channels on the guide.

   The needle must be the correct size for the needle guide.

6. Before performing any patient procedure, verify the needle path.

**[2] Instructions for Use**

Needle Path Verification Ch A4

# C2 Endo-V II Transducer

**Mechanical Sector Endo-V II Transducer ..... 3**
Note on Fetal Examinations ..... 4
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Preparation for Use ..... 6
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Imaging with the Endo-V II Transducer ..... 9
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**Endo-V II Needle Guide Bracket Kit ..... 13**

# Mechanical Sector Endo-V II Transducer

(Requires software version 2.0 or higher)

⚠ **WARNING:** Before attempting to use endocavity transducers, you should be trained in ultrasonography and endocavity scanning techniques, and you should be thoroughly familiar with the safe operation of the ultrasound imaging system.

**[1] Instructions for Use**

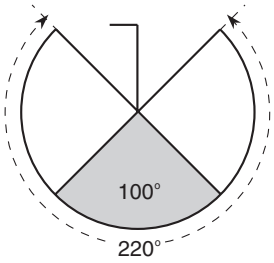
| | |
|---|---|
| Cleaning and Care | Ch 2 |
| Storage | Ch 6 |

The Endo-V II transducer is a mechanical sector ultrasound transducer with rotating crystals for real-time imaging. The Endo-V II transducer is designed for endovaginal imaging of the general pelvic region, such as during the early stages of pregnancy, for detection of ectopic pregnancies, and for examination of the follicles, ovaries, fallopian tubes, inner cavities, bladder, and uterus.

The Endo-V II transducer is intended for use with the ultrasound imaging system in 2D-mode and M-mode. You can use the transducer to acquire images in Dual mode, Split mode (B+B), 4B-mode, and 2D/M-mode.

The acoustic portion of the transducer consists of two acoustic elements, one 5.0-MHz element and one 7.5-MHz element. A third frequency of 6.0 MHz is provided by excitation of the 7.5-MHz crystal with a 5.0-MHz transmit pulse. You can use these frequencies to optimize the imaging capability for different depth-dependent areas of interest.

The transducer samples a 220° maximum sector angle. The position of the field of view is represented on the image screen by the shaded section of the Endo-V II symbol. The Endo-V II symbol has a hook that indicates the active scan direction.




*On-screen symbol for the Endo-V II transducer.*

# Note on Fetal Examinations

The following recommendation is excerpted from the National Institute of Health's *Consensus Statement on the Use of Ultrasound Imaging During Pregnancy*, Volume 5, No. 1, based on the recommendation issued at the Health Consensus Development Conference, February, 1984:

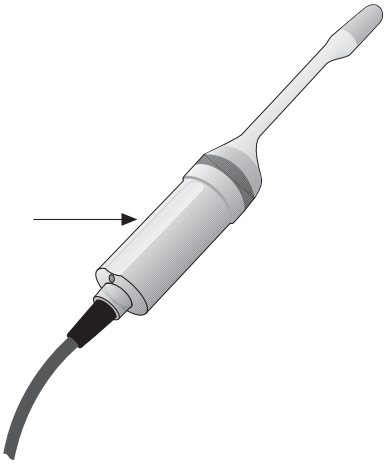
> Ultrasound examination in pregnancy should be performed for a specific medical indication. The data on clinical efficacy and safety do not allow a recommendation for routine scanning at this time.
>
> Ultrasound examination performed solely to satisfy the family's desire to know the fetal sex, to view the fetus, or to obtain a picture of the fetus should be discouraged. In addition, visualization of the fetus solely for educational or commercial demonstrations without medical benefit should not be performed.

# Transducer Markings

The Endo-V II transducer is designed with an orientation indicator on the handle of the transducer.

## Transducer Handle

An indentation on the handle of the transducer provides you with an orientation reference to the echo in the image.



*Example of Orientation Indicator on Transducer Handle.*

# Preparation for Use

⚠ **WARNING:** Ensure the transducer is properly cleaned and high-level disinfected before use to avoid possible patient contamination.

**[1] Instructions for Use**

Cleaning and Disinfecting Ch 2

## Using a Protective Sheath

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and be prepared to treat allergic reactions promptly. For additional information, refer to FDA Medical Alert MDA91-1.

**[2] Instructions for Use**

Transducer Sheaths Ch C1

For patient and operator safety, cover the Endo-V II transducer with a protective cover at all times during use.

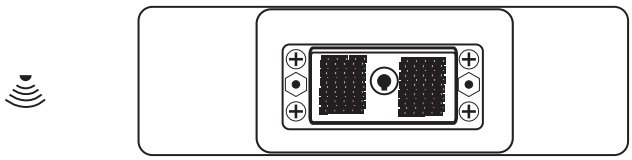
# Connecting the Transducer

⚠ **Caution:** When moving the system, disconnect the transducer and transport it separately in the transducer case provided.

⚠ **Caution:** To avoid damaging the transducer cable, do not pull on the cable to disconnect the transducer. Turn the connector lock counter-clockwise, and pull the connector by holding onto the housing.

**Note:** Always freeze the system when connecting or disconnecting the Endo-V II transducer.

**Note:** Place the transducer in the transducer holder on the system or in its carrying case when not in use.



*Mechanical sector port.*

### To connect a mechanical sector transducer:

1. Insert the connector pins into the system port. Adjust the connector until you can turn the lever on the transducer connector clockwise to lock it in position.

   This secures the connector in position and ensures the best possible contact.

2. Place the transducer in the transducer holder and drape the cable through the cable hangers.

# Activating the Endo-V II Transducer

Although multiple transducers can be connected to the ultrasound system, only one transducer can be active.

Use the system presets to select the transducer port that will be active at system power-on.

**To activate a transducer connected to the system:**

1. Press the **TRANSDUCER** key located on the control panel.

   The name of the active transducer displays on the upper left of the screen.

2. To activate another transducer connected to the system, press the **TRANSDUCER** key again.

**System Reference**

System Presets Ch 3

**F6**

Boot Up
▶Transducer Port Active On Boot Up

# Imaging with the Endo-V II Transducer

The Endo-V II transducer supports all of the functions and controls that are available in 2D-mode and M-mode.

When you have acquired an image, you can change the orientation of the image, make measurements and calculations, annotate with pictograms or text, or perform a biopsy or puncture procedure.

**[2] Instructions for Use**

Pictograms Ch A1
Imaging Functions Ch A3
Measurements and Calculations Ch B1
OB Measurements and Calculations Ch B2
EM Measurements and Calculations Ch B3

## Changing the Transmit Frequency

- Push the **MULTIHERTZ** control on the control panel up to increase the frequency or down to decrease the frequency.

  The system uses the next available frequency, 5.0 MHz, 6.0 MHz, or 7.5 MHz, for imaging. The system displays the name of the active transducer and operating frequency in the upper left of the image screen.

## 2D/M-Mode Display and Update

For mechanical sector transducers, the system defaults to a periodically refreshed 2D-mode image with a real-time M-mode sweep. The 2D-mode image is frozen until the M-mode sweep is complete. The M-mode sweep then freezes while the 2D-mode image is refreshed, and then displays again in real time.

Use the system presets to set the refresh rate for mechanical sector transducers.

**System Reference**

System Presets Ch 3

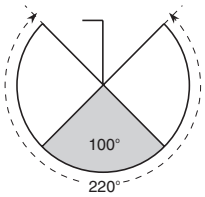
**F6**

Imaging
▶Update Frames in 2D/M

## Changing the Field of View

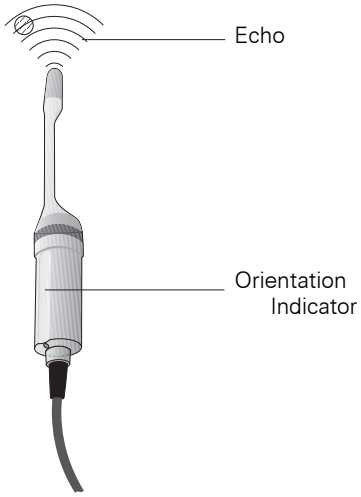
The Endo-V II transducer is designed for imaging in a maximum 220° field of view. You can select a structure of interest anywhere in the 220° scan plane.

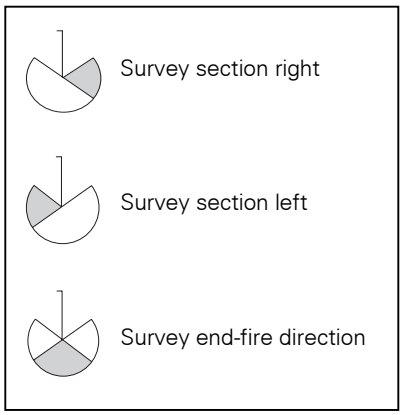
A graphic, the Endo-V II symbol, represents the transducer's 220° field of view for the endovaginal transducer. The symbol displays on the right side of the image screen. Within the symbol is a shaded sector that represents the active imaging sector. You may place the shaded sector anywhere within the Endo-V II symbol. This use of the trackball steers the on-screen image.




*On-screen symbol for the Endo-V II transducer.*

The hook at the top of the symbol represents changes in the scanning direction of the transducer.



Use the system presets to remove or display the scan plane icon on the image screen.

**System Reference**

System Presets Ch 3

**F6**

Display
▶Scan Plane Icon

**To select the sector angle:**

1. Press the **MENU** key on the control panel when 2D-mode is active.
2. Roll the trackball to **Scan Angle** on the 2D-mode menu.

   The current angle setting displays next to the selection. The scan angle on the ultrasound system represents the imaging sector. The available angle selections are 80°, 110°, 160°, and 220°.
3. Select the scan angle by rotating the **SELECT** control on the control panel.
4. Roll the trackball to place the imaging sector within the field of view for the active plane.

## Changing the Image Orientation

You can change the image orientation by rotating the image and by changing the scan direction.

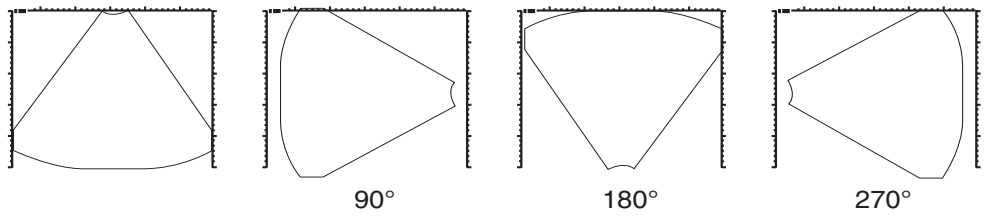



*Image Orientation*

**To rotate the image:**

- Press and hold the **SHIFT** key on the keyboard and then press the **L/R FLIP** button on the control panel to rotate the image 90° clockwise.

**To change the scan direction:**

- Press the **L/R FLIP** button on the control panel.

# Technical Data ▪ Mechanical Sector
# Endo-V II Transducer

| | |
|---|---|
| **Transducer type:** | Mechanical Sector (two rotating crystals) |
| **Frequency range:** | 5.0 to 7.5 MHz |
| **Focus:** | 5.0 MHz: 30 ±5 mm<br>7.5 MHz: 25 ±5 mm |
| **Operating modes:** | 2D, Dual, Split (B+B), 4B, M, 2D/M |
| **Maximum displayable field of view:** | 220° |
| **Sector angle:** | 80°, 110°, 160°, 220° |
| **Scanning direction:** | Right/left<br>Bottom, 90°, 180°, 220° image rotation |
| **Orientation:** | On-screen graphical icon indicates sectional orientation. |
| **Operating environment:** | +20°C to +40°C |
| **Storage:** | -5°C to +50°C |
| **Humidity:** | Up to 80% relative humidity |

# Endo-V II Needle Guide Bracket Kit

The optional stainless steel, reusable needle guide attachment provides the ability to perform biopsy procedures with the Endo-V II sector transducer. Two different sizes of attachments are available: one supports needle sizes up to 18 gauge/1.2 mm and the other supports needle sizes up to 16 gauge/1.6 mm.

**[2] Instructions for Use**

| | |
|---|---|
| Compatible Transducers | Ch C1 |

*Example of the Endo-V II Needle Guide.*

## Preparation for Use ▪ Endo-V II Needle Guide Bracket Kit

**[2] Instructions for Use**

| | |
|---|---|
| Needle Path Verification | Ch A4 |

⚠ **WARNING:** Do not attempt to use the Needle Guide Bracket Kit until you have read the following instructions. The needle guide should only be used after proper training and after verifying the path of the needle.

⚠ **WARNING:** The needle guide is packaged non-sterile. Sterilize this product prior to its first use.

⚠ **WARNING:** Ensure that the needle guide is properly cleaned and sterilized before each use to avoid possible patient contamination.

**[1] Instructions for Use**

| | |
|---|---|
| Cleaning and Care | Ch 2 |
| Sterilization | Ch 2 |

⚠ **WARNING:** Before attaching the needle guide to the transducer, place the transducer in a sterile transducer sheath.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

⚠ **Caution:** Use only a water-based ultrasound coupling agent (gel) with this kit. Petroleum- or mineral oil-based materials can harm the transducer.

### To attach the needle guide to the transducer:

⚠ **WARNING:** Care must be taken to ensure that the needle guide is properly positioned. When properly positioned, the bracket will cover the colored ring on the transducer handle and the hook will be firmly against the transducer tip.

1. Place a sterile transducer sheath over the transducer.

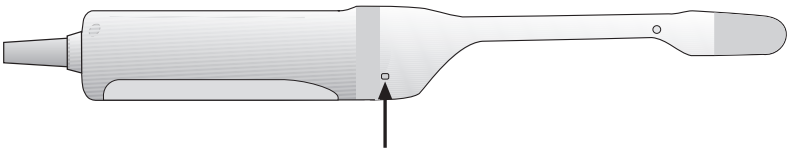
   To ensure an accurate scan, there should not be any air bubbles or wrinkles between the transducer face and the transducer sheath.

2. Loosen the thumb screw in the needle guide bracket.

1 Bracket
2 Thumb screw
3 Hook

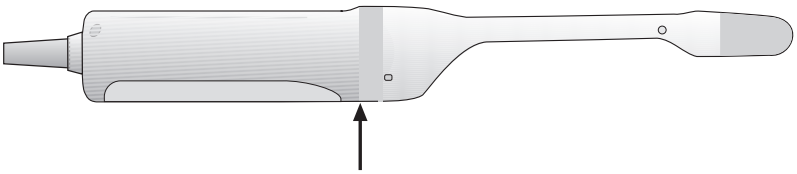
3. Lift up the thumb screw to open the bracket. Place the screw on the outside of the bracket

   Notice the bumps on the inside of the bracket end of the needle guide. These bumps must fit in the indentations above the colored ring on the transducer handle.



**Note:** For illustration purposes only, the transducer is shown without a transducer sheath. Always place a sterile transducer sheath over the transducer.

4. Place the hook over the middle of the transducer's shaft and then slide it up the length of the shaft.
5. Align the lower edge of the bracket with the lower edge of the colored ring on the transducer handle.



6. Align the bumps on the inside of the bracket with the indentations above the colored ring on the transducer handle.

   When properly positioned, the bracket must cover the colored ring and the raised bar fits in the notch.

7. Close the bracket, reposition and tighten the thumb screw.
8. Before performing any patient procedure, verify the needle path.

**[2] Instructions for Use**

Transducer Sheaths Ch C1

**[2] Instructions for Use**

Needle Path Verification Ch A4

# C3 Endo-P II Transducer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Longitudinal Scan Plane Symbol ..... 6
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# Mechanical Sector Endo-P II Transducer

(Requires software version 2.0 or higher)

⚠ **WARNING:** To reduce the risk of electrical shock, you must use the protective sheaths that are specified in the Endo-P II transducer kit number 10030776.

You must refer to the in-box instructions for proper application of the protective sheath.

⚠ **WARNING:** Before attempting to use endocavity transducers, you should be trained in ultrasonography and endocavity scanning techniques, and you should be thoroughly familiar with the safe operation of the ultrasound imaging system.

⚠ **WARNING:** To avoid electrical shock to the patient, you must visually inspect the transducer prior to each use. Examine the entire transducer with particular attention to the transducer tip. Do not use the transducer if the transducer tip is cracked or shows signs of fluid leakage. Do not use a transducer which has a cracked, punctured, or discolored casing or a frayed cable.

***Discoloration Exception:*** The use of Cidex OPA and Gigasept FF disinfectants may cause discoloration of transducer housings. You can continue to use a transducer if it is discolored due to the use of these specific disinfectants only.

**[1] Instructions for Use**

Approved List of Disinfectants Ch 2

The Endo-P II transducer is intended for use with the ultrasound imaging system in 2D-mode and M-mode. You can use the transducer to acquire images in Dual mode, Split mode (B+B), 4B-mode, and 2D/M-mode.

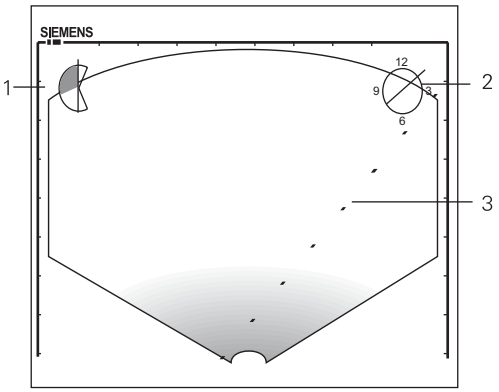
The Endo-P II transducer is a mechanical sector ultrasound transducer with rotating crystals for real-time imaging. The Endo-P II transducer is designed for adult endorectal sonography of the rectum, prostate, bladder, and urethra.

The acoustic portion of the transducer consists of two acoustic elements; one operates at a frequency of 5.0 MHz, and the other at 7.5 MHz. A third frequency of 6.0 MHz is provided by excitation of the 7.5-MHz crystal with a 5.0-MHz transmit pulse, resulting in 6.0-MHz imaging. You can use these frequencies to optimize the imaging capability for different depth-dependent areas of interest.

# Scan Planes

The Endo-P II transducer enables you to view an area of interest in both the transverse and longitudinal planes, without having to reposition the transducer. Instead, you can use the trackball and on-screen graphics to position an active imaging sector.

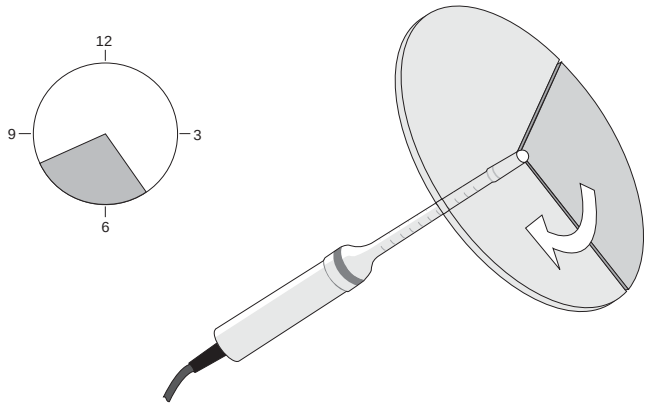
The transverse plane can provide a 355° field of view and the longitudinal plane can provide a 240° field of view. The scan planes are represented as graphical symbols on the image screen. The system automatically displays both scan plane symbols on the image screen when you activate the Endo P-II transducer.




1 Longitudinal scan plane symbol
2 Transverse scan plane symbol
3 In-line cursor - indicates the orientation of the transverse plane in relation to the longitudinal plane

*In this example, the Endo-P II transducer is scanning in the longitudinal plane as indicated by the shaded sector in the longitudinal plane symbol on the upper left.*

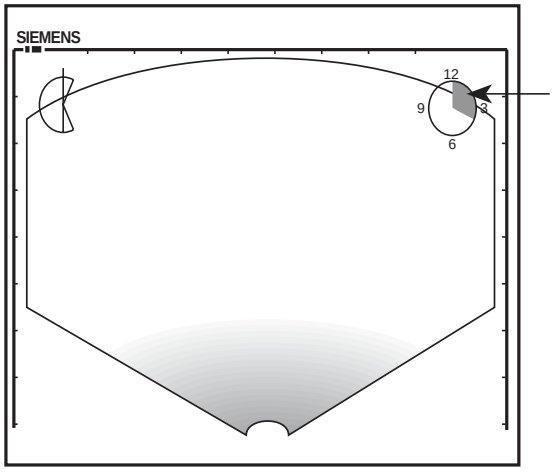
# Transverse Scan Plane Symbol




The transverse plane symbol is a circle representing the transducer's field of view.

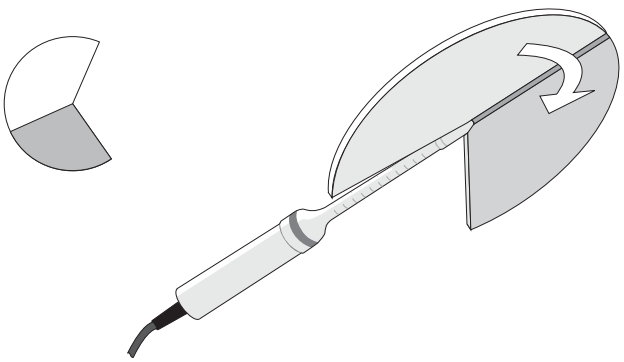
*Transverse Plane Symbol and Transverse Plane.*

The transverse plane is the initial plane for the Endo-P II transducer. By rolling the trackball, you can position the shaded sector anywhere within the field of view. This use of the trackball steers the field of view. The shaded sector shown in the transverse plane symbol is relative to the position of the transducer.




When the transverse plane is active, a shaded sector, representing the active imaging sector, displays within the transverse scan plane symbol.

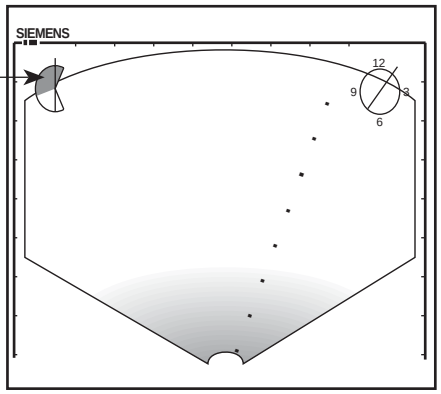
# Longitudinal Scan Plane Symbol



*Longitudinal Plane Symbol and Longitudinal Plane.*

The longitudinal scan plane symbol represents the Endo-P II transducer's 240° field of view in the longitudinal plane. By rolling the trackball, you can move the sector anywhere within the 240° scan plane. This use of the trackball steers the field of view.

When the longitudinal plane is active, a shaded sector, representing the active imaging sector, displays within the longitudinal scan plane symbol.

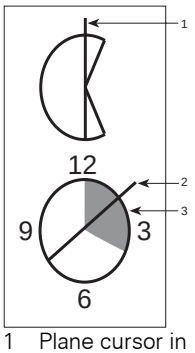


## Plane Cursor

Both the transverse and longitudinal plane symbols display a plane cursor when that plane is active. The plane cursor indicates the position of the two planes relative to each other, representing the line where the active plane is intersected by the alternate plane at a 90° angle.

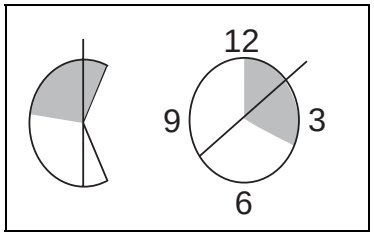
When you change planes from transverse to longitudinal, the transducer acquires the active imaging sector at the position of the plane cursor in the transverse plane symbol. For this reason, ensure that the plane cursor protrudes through the shaded sector in the active plane symbol as shown below. If the cursor does not protrude through the shaded sector in the symbol, the plane cursor and sector are not properly aligned.

The plane cursor for the longitudinal plane is fixed and cannot be moved. However, you can roll the trackball to reposition the shaded sector.



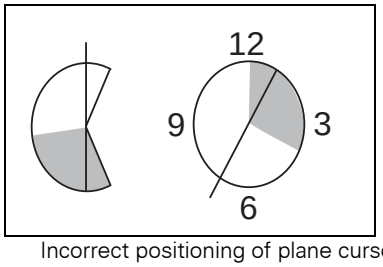

1 Plane cursor in longitudinal scan plane symbol
2 Plane cursor in transverse scan plane symbol
3 Shaded sector

**Correct**




Correct positioning of plane cursor shown in the longitudinal (left) and transverse (right) plane symbol.

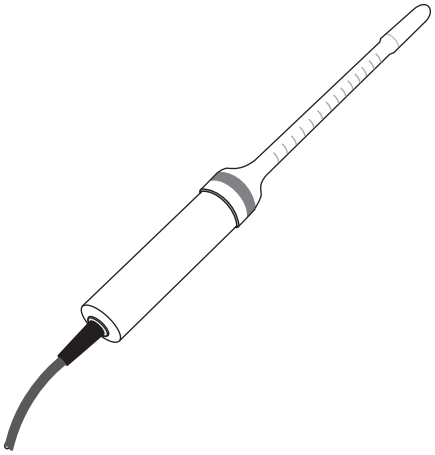
**Incorrect**




Incorrect positioning of plane cursor. The cursor must extend through the shaded sector.

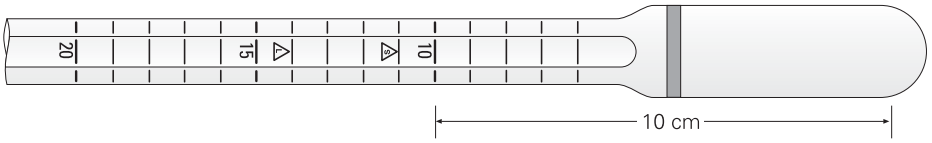
# Transducer Markings and Indicators

The Endo-P II transducer is designed with orientation markings on the handle of the transducer and depth markings along the shaft of the transducer.



## Transducer Shaft

The transducer shaft is marked in one-centimeter increments from 6 cm to 20 cm. These markings indicate the depth of the transducer upon insertion into the rectum. The markings also provide a reference for attaching accessories.

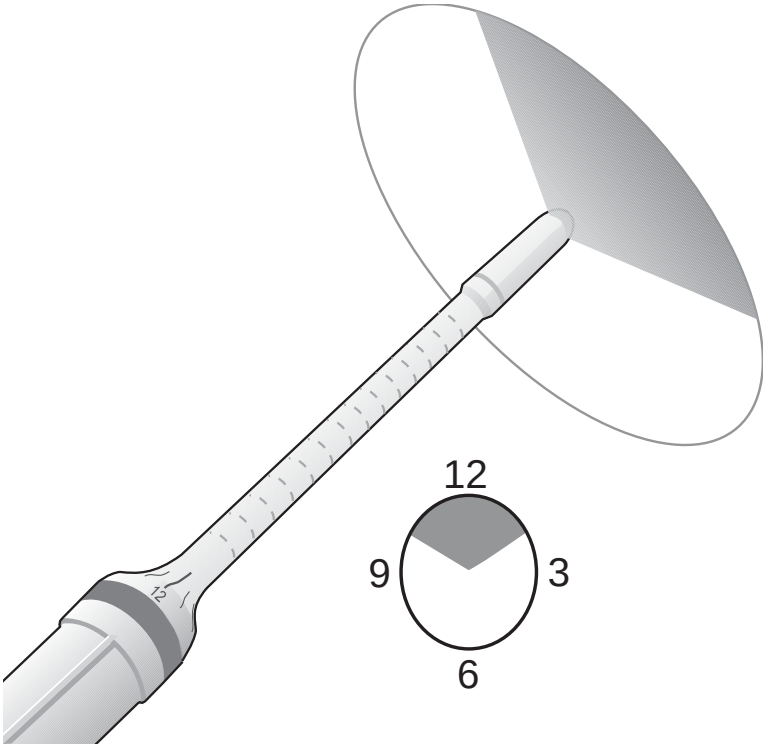



*Transducer Insertion Depth Marks.*

## Transducer Handle

The transducer handle contains the numbers 3, 6, 9, and 12. These numbers correspond to the numbers in the transverse scan plane symbol that displays on the image screen. Use these numbers as a reference when imaging with the transducer.

By holding the transducer with the number 12 on top, you can orient the transducer with the scan plane symbol as shown in the following example.




*Orientation Markings for Transverse Plane Symbol.*

The numbers shown in the transverse plane symbol indicate the relationship of the sector image to the handle on the transducer. This symbol displays in the image area.

When you roll the trackball to change the location of the imaging sector, the position of the shaded sector in the symbol also changes in a corresponding manner.

# Preparation for Use

⚠ **WARNING:** Ensure the transducer is properly cleaned and high-level disinfected before use to avoid possible patient contamination.

⚠ **WARNING:** To avoid electrical shock to the patient, you must visually inspect the transducer prior to each use. Examine the entire transducer with particular attention to the transducer tip. Do not use the transducer if the transducer tip is cracked or shows signs of fluid leakage. Do not use a transducer which has a cracked, punctured, or discolored casing or a frayed cable.

***Discoloration Exception:*** The use of Cidex OPA and Gigasept FF disinfectants may cause discoloration of transducer housings. You can continue to use a transducer if it is discolored due to the use of these specific disinfectants only.

**[1] Instructions for Use**

Cleaning and Disinfecting Ch 2
Approved List of Disinfectants Ch 2

## Using a Protective Sheath

⚠ **WARNING:** To reduce the risk of electrical shock, you must use the protective sheaths that are specified in the Endo-P II transducer kit number 10030776.

You must refer to the in-box instructions for proper application of the protective sheath.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and be prepared to treat allergic reactions promptly. For additional information in the U.S.A., refer to FDA Medical Alert MDA91-1.

For patient and operator safety, you must cover the Endo-P II transducer with a protective sheath at all times during use.

Refer to the in-box instructions for proper application of the protective sheath.

# Connecting the Transducer

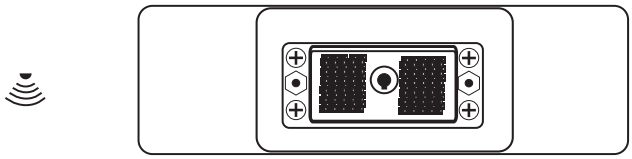
⚠ **Caution:** When moving the system, disconnect the transducer and transport it separately in its protective carrying case.

⚠ **Caution:** To avoid damaging the transducer cable, do not pull on the cable to disconnect the transducer. Turn the lock counter-clockwise and grasp the connector by holding on to the connector housing.

**Note:** Always freeze the system when connecting or disconnecting the Endo-P II transducer. The transducer should be in the transverse plane before it is disconnected from the system.

**Note:** Always ensure that the Endo-P II transducer is in the transverse plane and the system is in freeze before activating another transducer, disconnecting the Endo-P II transducer, or powering off the system.

**Note:** Place the transducer in the transducer holder on the system or in its protective carrying case when not in use.



*Mechanical sector port.*

### To connect a mechanical sector transducer:

1. Hold the transducer connector with the cable pointing upwards.
2. Insert the connector pins into the system port and turn the lock on the transducer connector clockwise until it locks in position.

   This secures the connector in position and ensures the best possible contact.
3. Place the transducer in the transducer holder and drape the cable through the cable holder.

# Activating a Transducer

Although multiple transducers can be connected to the ultrasound system, only one transducer can be active.

Use the system presets to select the transducer port that will be active at system power-on.

**To activate a transducer connected to the system:**

1. Press the **TRANSDUCER** key located on the control panel.

   The name of the active transducer displays on the upper left of the screen.

2. To activate another transducer connected to the system, press the **TRANSDUCER** key again.

**System Reference**

System Presets Ch 3

**F6**

Boot Up
▶Transducer Port Active On Boot Up

# Imaging with the Endo-P II Transducer

The Endo-P II transducer supports all of the functions and controls that are available in 2D-mode and M-mode.

When you have acquired an image, you can change the orientation of the image, make measurements and calculations, annotate with pictograms or text, or perform a biopsy or puncture procedure.

## Changing the Transmit Frequency

- Push the **MULTIHERTZ** control on the control panel up to increase the frequency or down to decrease the frequency.

  The system uses the next available frequency, 5.0 MHz, 6.0 MHz, or 7.5 MHz, for imaging. The system displays the name of the active transducer and operating frequency in the upper left of the image screen.

## 2D/M-Mode Display and Update

For mechanical sector transducers, the system defaults to a periodically refreshed 2D-mode image with a real-time M-mode sweep. The 2D-mode image is frozen until the M-mode sweep is complete. The M-mode sweep then freezes while the 2D-mode image is refreshed, and then displays again in real time.

Use the system presets to set the refresh rate for mechanical sector transducers.

**System Reference**

System Presets Ch 3

**F6**

Imaging
▶ Update Frames in 2D/M

# Selecting the Sector Angle and Adjusting the FOV

F6

Display
▶Scan Plane Icon

You can change the sector angle to select the field of view. The scan plane icon indicates the position of the field of view. Use the system presets to display the scan plane icon.

**To select the sector angle:**

1. Press the **MENU** key on the control panel when 2D-mode is active.
2. Roll the trackball to **Scan Angle** on the 2D-mode menu.

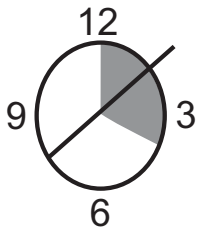
   The current angle setting displays next to the selection. The scan angle on the ultrasound system represents the imaging sector. The available angle selections are 80°, 110°, 160°, and 220°.
3. Select the scan angle by rotating the **SELECT** control on the control panel or cycle through the selections by pressing the **SET** key.
4. Place the imaging sector within the field of view for the active plane by rolling the trackball.
5. To rotate the sector and plane cursor in the longitudinal plane:

   a. Press the **SELECT** control.

   b. Roll the trackball to place the sector and plane cursor.

   c. Press the **SELECT** control to release the plane cursor.

   The active imaging sector is represented by a shaded sector in the graphical plane symbols that display onscreen.



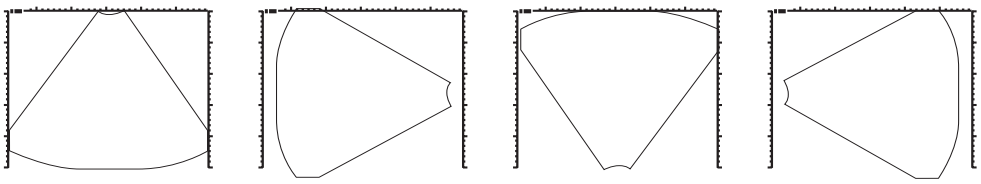

When the transverse plane is active, a shaded sector is depicted in the transverse scan plane symbol.

When the longitudinal plane is active, the shaded sector is depicted in the longitudinal scan plane symbol.

*The sector in these illustrations represents a 110° scan angle selection.*

## Changing the Image Orientation

The following illustrations indicate how the displayed image is oriented when you use **ROTATE**. Each press of **ROTATE** rotates the image 90° clockwise.

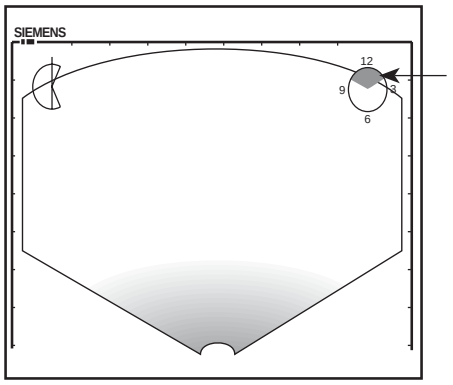


## Selecting a Scan Plane

To make it easier to locate the area of interest, begin imaging in the transverse plane, then change to the longitudinal plane.

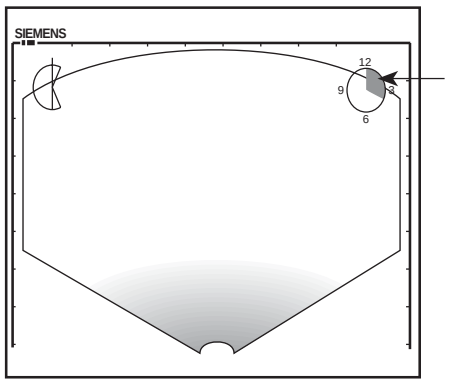
**To change from the transverse to the longitudinal plane:**

1. Using the Endo-P II transducer in the transverse plane, acquire an image.




The shaded sector is in the transverse scan plane symbol when you are imaging in the transverse plane.

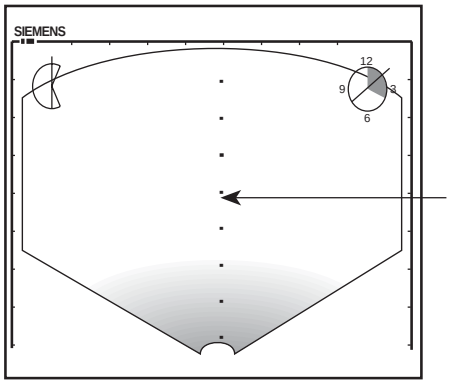
2. Roll the trackball until the area of interest displays on the image screen.




The scan plane symbol containing the shaded sector represents the active imaging sector.

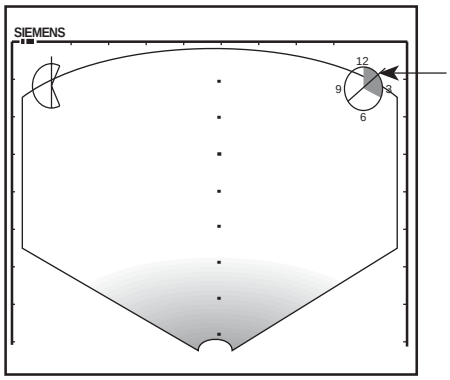
**NOTE:** When the 355° field of view is active, the trackball will not change the scan plane.

3. Press **SET** to place the in-line cursor on the image screen.




The in-line cursor indicates where the intersection of the longitudinal plane will occur.

4. Roll the trackball to place the in-line cursor in the area of interest.

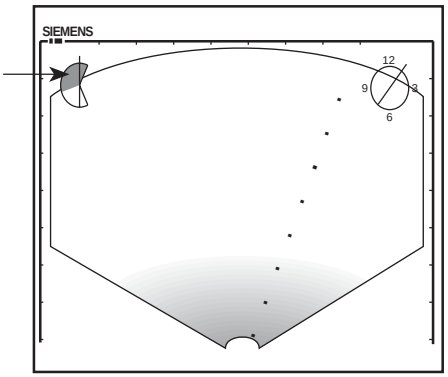



The position of the in-line cursor is represented by the plane cursor in the transverse scan plane symbol. The plane cursor must protrude through the shaded sector in the icon.

5. Press **SET** to change to the longitudinal plane.

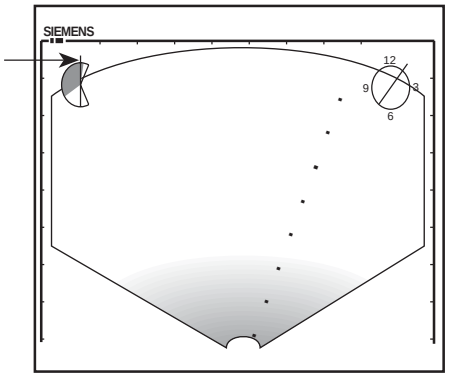
   The transducer changes from the transverse plane to the longitudinal plane and is indicated by the shaded sector in the longitudinal plane icon.

The in-line cursor indicates the intersection of the transverse plane. The plane cursor is in a fixed position when imaging in the longitudinal plane.




6. To reposition the sector in the longitudinal plane, roll the trackball.

The plane cursor in the longitudinal plane icon must protrude through the shaded sector in the symbol.




7. To return to the transverse plane, press **SET**.

   The image displays with the in-line cursor. To remove the in-line cursor, press **ESCAPE**.

8. Always ensure that the Endo-P II transducer is in the transverse plane and the system is in freeze before activating another transducer, disconnecting the Endo-P II transducer, or powering off the system.

## Measurements and Calculations

Measurements are available for determination of volume and other calculations. The Stepwise Volume and Incremental Volume are exclusively for use with the Endo-P II transducer.

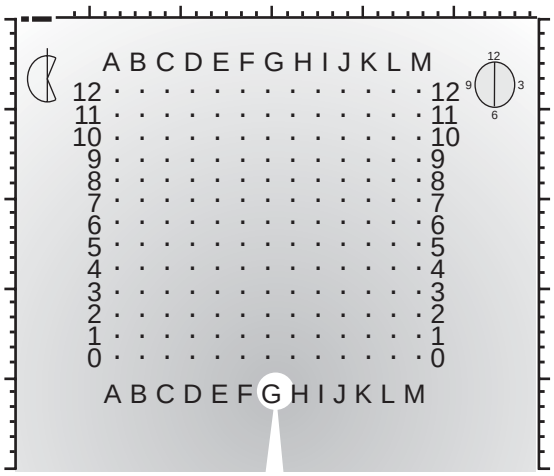
## Biopsy or Puncture Procedures

When you use a needle guide with the Endo-P II transducer, always begin imaging in the transverse plane. Since the needle guide is in a fixed position on the transducer, you cannot reposition the active image sector using the trackball. The active image sector during a biopsy or puncture procedure is at the 12 o'clock position of the transducer.

To locate the region of interest, rotate the Endo-P II transducer. Ensure that the in-line cursor passes through the region of interest, and then switch to the longitudinal plane.

**[2] Instructions for Use**

Biopsy Ch A4




*Example of **Tpl** (template) guidelines available for use with the brachytherapy option.*

# Endo-P II Transducer Accessories

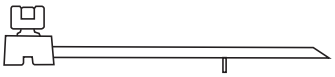
Refer to the in-box instructions for proper application of the protective sheath.

## Endo-P II Needle Guide Kit

The Endo-P II Needle Guide Bracket Kit consists of the bracket, syringe-adapter, and cleaning brush. The kit can be configured with three different needle guide sets:

**Endo-P II Needle Guide Sets**

*90 mm linear needle guide, qty 3*



*120 mm needle guide, qty 3*

*120 mm curved needle guide, qty 3*

## Preparation for Use

⚠ **WARNING:** To reduce the risk of electrical shock, you must use the protective sheaths that are specified in the Endo-P II transducer kit number 10030776.

You must refer to the in-box instructions for proper application of the protective sheath.

⚠ **WARNING:** Do not attempt to use the Needle Guide Bracket Kit until you have read the following instructions. The needle guide should only be used after proper training and after verifying the path of the needle.

⚠ **WARNING:** The bracket and needle guide sets are packaged non-sterile. Sterilize these products prior to their first use.

⚠ **WARNING:** Ensure the bracket and needle guide are properly cleaned and sterilized before each use to avoid possible patient contamination.

⚠ **WARNING:** There have been reports of severe allergic reactions to medical devices containing latex (natural rubber). Health care professionals are advised to identify latex-sensitive patients and to be prepared to treat allergic reactions promptly. In the USA, refer to FDA Medical Alert MDA91-1.

⚠ **Caution:** Use only a water-soluble ultrasound coupling agent with this kit. Petroleum- or mineral oil-based materials can harm the transducer.

**[1] Instructions for Use**

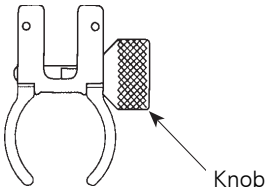
| | |
|---|---|
| Cleaning and Care | Ch 2 |
| Sterilization | Ch 2 |

**[2] Instructions for Use**

| | |
|---|---|
| Biopsy | Ch A4 |
| Needle Path Verification | Ch A4 |

**To attach the needle guide to the transducer:**

1. Place the tranducer in the protective sheath specified in the Endo-P II transducer kit. You must refer to the in-box instructions for proper application of the protective sheath.
2. Loosen the knurled knob on the bracket completely.




*Needle Guide Bracket.*

3. Position the bracket onto the Endo-P II transducer.

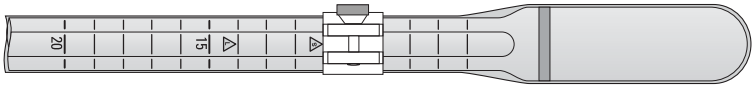
   The bracket should sit flat against the top level of the transducer.

*Attaching the Bracket to the Transducer, Top View.*

**Note:** If using the 90 mm needle guide only, perform step 4. If using either of the 120 mm needle guides, skip step 4 and proceed to step 5.

4. ***For the 90 mm needle guide only***, slide the bracket until the center is aligned with the 10 cm marking on the transducer.

   The edge of the bracket closest to the scan face of the transducer should align with the 9 cm marking on the transducer shaft. Now tighten the knurled knob of the bracket. Proceed to step 6.



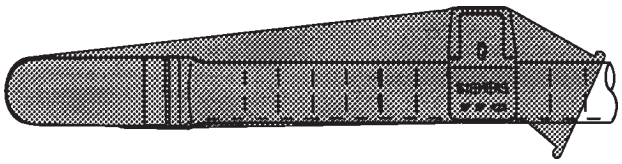

*Bracket Position for 90 mm Needle Guides, Top View.*

5. Slide the bracket until the center is aligned with the 13 cm marking on the transducer.

   The edge of the bracket closest to the scan face of the transducer should align with the 12 cm marking on the transducer shaft. Now tighten the knurled knob of the bracket.

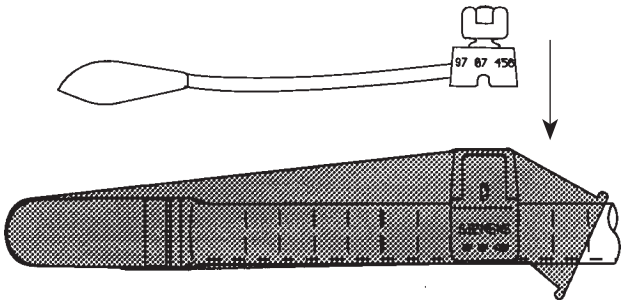
*Bracket Position for 120 mm Needle Guides, Top View.*

6. Wet the covered transducer tip with a water-soluble coupling agent.
7. Pull a transducer sheath (not a protective sheath provided in the Endo-P II transducer kit) tightly over the transducer and bracket.



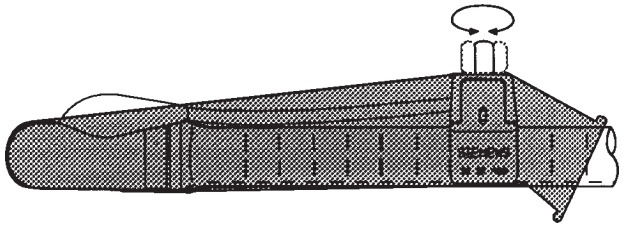
*Covering the Transducer and Bracket.*

8. Set the needle guide on the bracket.



*Placing a Curved Needle Guide onto the Bracket.*

9. Rotate the needle guide lock 90° to secure the needle guide to the bracket.



*Securing the Needle Guide to the Bracket.*

10. Insert the desired needle into the needle guide.

    The needle size should be a maximum of 18 gauge with a recommended length of at least 20 cm.

11. Before performing any patient procedure, verify the path of the needle.

**[2] Instructions for Use**

Needle Path Verification Ch A4

# Technical Data ▪ Mechanical Sector Endo-P II Transducer

| | |
|---|---|
| **Transducer type:** | Mechanical Sector (two rotating crystals) |
| **Frequency range:** | 5.0, 6.0 and 7.5 MHz for B-mode |
| **Focus:** | 5.0 MHz: 25 mm<br>7.5 MHz: 22 mm |
| **Operating modes:** | B, 2B, SPLIT B (B+B), 4B, M, B/M |
| **Maximum displayable field of view:** | Transverse plane: 355°<br>Longitudinal plane: 240° |
| **Sector angle:** | 80°, 110°, 160°, 240°, 355° |
| **Scanning direction:** | Right/left<br>Bottom, 90°, 180°, 270° image rotation |
| **Field size:** | 3 to 12 cm |
| **Orientation:** | An icon for the longitudinal plane and an icon for the transverse plane. |
| **Operating environment:** | +20°C to +40°C<br>Up to an altitude of 3,000 m |
| **Storage:** | -5°C to +50°C<br>Up to an altitude of 4,000 m |
| **Humidity:** | Up to 80% relative humidity at 40°C |